The Dock & Harbour Authority

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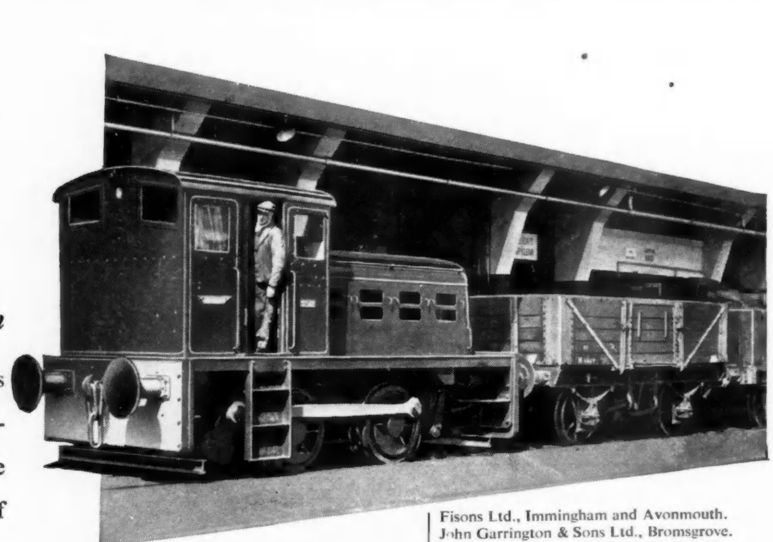

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Editorial Comments

The Port of Hull.

The second of the series of articles on the Humber Ports deals with the Port of Hull, which, according to recent statistics issued by H.M. Customs, now ranks third in the list of U.K. Ports, as far as the value of trade is concerned. The comprehensive account of the activities of the port, which will be found on a following page, provides a lucid example of its commercial importance and we have little to add to the information supplied.

In view of the world-wide interest that is being shown regarding the need for efficiency in port working methods, however, we would call attention to several features at Hull that could perhaps be adopted elsewhere. As has been reiterated in many past issues of this Journal, methods of cargo handling vary between port and port, and owing to geographical and other discrepancies, it is unwise to dogmatise about which system should be employed.

The chief points of interest to be noted in the article are: the importance of the lighterage trade which deals with an appreciable percentage of the inward and outward cargoes, the unique system of handling timber from alongside ship, the modern methods employed in the fishing and ancillary industries and the flat roofs on a number of the sheds which are used for the reception of suitable cargo.

Working Costs of Steam and Diesel Shunting Locomotives.

In view of the articles that have appeared in recent issues of this Journal dealing with the economics and performance of shunting locomotives, it was interesting to see in "The Journal of Commerce" last month, a comparison of the relative working costs of diesel and steam-driven locomotives on dock estates.

The correspondent dealt with three important questions: are diesel locomotives more economical than steam? Are they as reliable? Are they as efficient?

Regarding the first question, statistics indicate that a considerable saving is shown by the diesel-driven engine. The average operating costs of two steam locomotives over a one-year period were: Coal £1,088; water £50; repairs and maintenance £1,300; stores £78; cleaner, etc. £440; a total of £2,956 per unit. Corresponding figures for a diesel locomotive over a period of six months were: Fuel oil and lubricants £103; repairs and maintenance £84; stores £7; cleaner £44; and spares £4; making a total of £242, or approximately £484 per annum.

These figures indicate a saving of nearly £2,500 per year for the diesel locomotive, although it must not be forgotten that they relate to a new engine, and that as it becomes older the repair and maintenance costs will increase. However, it seems unlikely that they will approach the maintenance costs quoted for the steam engine, which stands at the high figure of £1,300 per annum.

On the question of reliability, there are no figures available with regard to the amount of time the different locomotives have spent, or are likely to spend, undergoing repairs. The dependability of any engine is contingent upon the efficiency of its maintenance, the ability of its various drivers and a number of other factors. Which type is the more reliable is perhaps a matter of opinion—the steam engine has already proved itself in this respect, and for the diesel-driven locomotive it may be said that the growing numbers to be found on dock estates give sufficient indication of faith in its performance.

Where efficiency is concerned, the diesel engine must be smaller than its opposite number in order to secure the maximum saving, the reason being that the capital cost increases greatly with the power. Nevertheless, it is claimed to be more efficient and to have a longer working day, due to immediate availability, than the steam engine. When this factor is considered with the lesser maintenance costs, it appears that a smaller sized diesel will adequately replace a larger steam locomotive.

There appears little doubt that the recent increases in maintenance, fuel and labour costs have dealt the steam engine a very heavy blow. In particular, the high running costs mentioned above are largely due to the considerable increase in the price of coal. Port Authorities, when considering their budgets and outlay on new equipment will doubtless take these points into consideration.

Range Action at Cape Town.

Recent press reports from South Africa indicate that there has this year been a severe recrudescence of range action in Table Bay, causing risk of heavy damage to ships especially in the Duncan Basin. The danger seems to be particularly acute in respect of loaded tankers. It is stated that during the recent trouble it required two tugs to hold a loaded tanker at her wharf; as a result the tug capacity of the port was over-extended, and no new arrivals could be dealt with until the moored ships could dispense with their tug aid.

The mortality rate of ropes and wires is to some extent offset by a substantial increase in tug revenue, derived from ships which, after paying for a safe wharf, have to pay large sums in tug dues for being held alongside.

A westerly swell is allegedly responsible for a state of affairs which is causing much inconvenience in the port, including the uprooting of bollards and destruction of fairleads.

In the light of an extensive examination of the phenomenon of range in general and its occurrence at Cape Town in particular, results of which were published in this Journal from June to October, 1953 (B. W. Wilson) the trouble is caused mainly by major meteorological disturbances up to 1,000 miles from Table Bay, which in turn give rise to very long waves which enter the Bay and finally generate standing waves inside the breakwater and in the basins themselves. The westerly swell which has been recently noted, appears to be an accompaniment to rather than a cause of the damaging range action.

The incidence of range at Cape Town, with its accompanying inconvenience and damage is of an intermittent character, and several years may elapse between outbreaks of the phenomenon. It would therefore be a matter of some difficulty to relate the cost of remedial measures such as have been proposed (Wilson, March, 1954), to the saving which might result in terms of reduced damage and delay.

The problem is further complicated by the fact that at present the increased costs of port operation are passed direct to the shipowners in the form of tug dues, whereas the cost of the suggested remedy (an outer basin to protect the Duncan Basin)

Editorial Comments—continued

would have to be borne by increased harbour dues levied on all ships using the port.

In our view there is a possibility that another approach to the problem might consist in the installation of suitable wave recorders and frequency analysers which would give warning of the approach of the extremely low frequency waves which are considered to be the principal causative agents in the build-up of range within the docks. By this means the onset of range could be anticipated, and provision made as regards berthing and allocation of tugs to make the best of a situation for which there appears to be no simple or cheap remedy.

The St. Lawrence Seaway.

The fact that formal agreement has now been reached between the United States and Canada whereby the St. Lawrence Seaway will be constructed jointly by the two countries, has at last crystallised a project which has been under discussion for many years past. According to the latest figures, the cost of providing a deep water channel from Montreal to Lake Erie is estimated at nearly £93 million, while the accompanying power project is expected to cost a further £214 million.

Some idea of the magnitude of the whole scheme may be gained from the fact that it involves wholesale displacement of existing habitations, and the diversion of roads and railway lines. The present Canadian National main line from Montreal to Toronto will be submerged for a distance of 13½ miles, and provisional plans envisage two separate diversions of this line. Also, 26 miles of the Queen's Highway between Toronto and Montreal will be flooded and will have to be replaced.

The damming of the international section of the river will result in the abandonment of two Canadian towns and six villages, which will be either totally submerged or within the seepage area, and will involve the expropriation of large areas of land, and the resettlement of 6,500 people. The effects of damming at the Long Sault international rapids will be to create a lake nearly 32 miles long with a width of between one and four miles.

Port Labour in Australia.

During recent years, the press has frequently had occasion to call attention to the slow turn-round of shipping at Australian ports. It has now been announced in Melbourne that, in an endeavour to effect an improvement, the Australian Government is to decide the future of the Stevedoring Industry Board, which controls the wharf labour. It is considered by shipowners and other commercial concerns that the abolition of this Board would assist in achieving industrial peace. Replying to questions in the House of Representatives recently, the acting Minister of Labour and National Service said the Government's sole object was to obtain a better turn-round of ships.

A report prepared by the Australian Overseas Transport Association, representing producers, importers, exporters and oversea shipowners, says that the present system of control of the waterfront industry is ineffective. Shipowners regard the Board as a remnant of wartime control; they recommend that if the Government's policy is to retain some form of control, the authority should not have power to interfere with the employers' control of stevedoring. They also suggest that employers should have the right to implement disciplinary action.

The report calls attention to pretexts for disputes and stoppages which reveal "irresponsibility and indiscipline." It affirms that the Waterside Workers' Federation had exploited its monopoly, and both the Stevedoring Industry Board and shipowners had been guilty of appeasement. Other recommendations put forward are that employers should have a right to select labour, and that the Waterside Workers' Federation should be penalised if it refused to admit to membership labour recruited by the authority to fill the needs of ports.

The report reveals a serious state of affairs. For overseas ships alone, complete port stoppages last year cost £A396,000 (about £317,000 Sterling) and indications are that the cost will be greater in 1954. In addition, shortage of labour and lack of berths in the first five months of this year have wasted about £A547,000 (about £437,000 Sterling). With regard to stoppages and disputes, the report says: "Overtime rates of pay frequently are rewards for a stoppage. There are no real penalties in the present system."

It is to be hoped that a solution will be devised that will bring to an end the machinations of the malcontents who seem so frequently to be successful in causing trouble by means of "flimsy pretexts for disputes and stoppages" as exemplified in the report.

Topical Notes

Proposal to Extend Area Controlled by Port of Bristol.

A proposal to extend the limits of the port of Bristol, over which the Corporation exercises conservancy jurisdiction and is the responsible lighthouse authority, is to be considered by the City Council. The Docks Committee is asking that the main port anchorage at Walton Bay, which is six miles west of the port, should be brought under its control.

The anchorage has many advantages, for, since it is within half an hour's steaming of the dock entrance, vessels can remain at safe anchorage in the bay and be readily available when required to dock, thus avoiding congestion at the Avonmouth entrance.

The Docks Committee has for many years maintained a shore signal station at Walton Bay, and it is considered that it would be advantageous for vessels at anchor to come under its direct control. A Parliamentary Bill will be needed to give effect to the change.

New Oil Refinery for Western Australia.

The Anglo-Iranian Oil Company, Ltd., announce that the first tanker, carrying a cargo of crude oil from Kuwait, will berth at Kwinana Refinery, Western Australia, early next year. Work on the refinery, which is being built by the Australasian Petroleum Refinery Limited, the Australian associate of Anglo-Iranian, began two years ago, and the construction of all units is well advanced.

A 2,800-ft. L-shaped jetty, which is being built out into Cockburn Sound, is nearing completion. Prefabrication on shore of the concrete beams and decking has allowed work to continue despite recent storms. Three tankers will be able to berth at the jetty simultaneously. Two dredgers, have removed more than 5,000,000 cu. yds. of sand in deepening a channel through two sandbanks at the entrance to Cockburn Sound.

Output from the refinery will be more than 2¾ million tons of refined products annually; this will include 20,000 tons of bitumen which is to be produced at the request of the Western Australian Government.

New Russian River Port.

The Tass official Soviet News Agency has reported that work has begun near Ulyanovsk on a new river port for the Volga which, when it is completed in 1956, will be one of the largest ports in the Soviet Union. The site is several miles from the present river bed, which is being considerably widened by the construction of the largest hydro-electric power station in the world near Kuibyshev.

A feature of the new port will be a wave-breaker rendered necessary by the fact that waves on the Volga, which now never exceed three feet, are expected to rise to 15-ft. in stormy weather when the scheme is completed.

Development of Minor Ports in Bombay.

The immediate development of the minor ports to the south and north of Bombay has been strongly recommended to the State Government in a report by a sub-committee appointed in November last.

Along the 600-mile coast of Bombay there are in all 86 minor ports which are administered by the State Government through the Collector of Central Excise, Bombay. The sub-committee has recommended that Ratnagiri, Karwar, Dabhol, Jaigad, Deogad, Janjira, Vijayadurg and Rampar in the south and Broach and Billimora in the north should be given prior consideration for development.

The general need of these ports is improved navigation aids, dredging and the construction of new steamer jetties and sheds.

The Humber Ports

(2) The Port of Hull—Geographical and Historical Features

(Specially Contributed)

(Continued from page 102)

FIGURES published by H.M. Customs in their "Annual Statement of Trade of the United Kingdom" show that Hull ranks next to London and Liverpool for value of trade in foreign imports, exports and re-exports, and the soundness of the port's position as a gateway for commerce and industry is demonstrated by the fact that although normal commercial business was virtually suspended for the duration of each of the world wars, the cessation of hostilities on each occasion quickly brought recovery of its high place amongst the ports of Britain. The total tonnage of traffic dealt with through Hull during 1953 was 9,289,362 tons, the best since the war.

Retrospect.

From early in the history of trade between the Continent of Europe and the northern coasts of Britain, the mouth of the River Hull, 22 miles from the North Sea, was used as a haven for sea-going vessels. The town which later sprang up at this point took the name of the harbour, and was well known in seafaring circles long before King Edward I established it as a royal arsenal with a Charter in 1296, and gave it the name of Kingston upon Hull—still in use as the official title of the City. The shipping wharves of the River Hull or "Old Harbour" as it came to be known, grew more prosperous as Continental trade developed, and history records that the so-called "merchant princes" of Hull in the 14th, 15th and 16th centuries were powerful enough to assist the fortunes of succeeding monarchs in their bid for a place amongst the nations of commercial importance in those days.

Pioneers in Dock Building.

It was no doubt due to the foresight of the shipping interests of the time that the first dock in the country to be constructed outside London was opened at Hull in the year 1778. It was built on part of the site of the old moat of the City, and had a water area of 24 acres. The provision of enclosed water proved attractive to the ships which were then being constructed in larger dimensions, and from that time the development of Hull as a large port was certain. This first dock, for many years known as the Queen's Dock, had a life of useful service covering 150 years and was closed and filled-in in 1934. Dock building continued throughout the 19th century, and whilst the early development at Hull continued to follow the line of the ancient wall and moat, by 1870 expansion had taken place East and West along the banks of the River Humber. In these directions the port of Hull continued to enlarge, and at present comprises 11 docks with a total water area of 200 acres, 12 miles of quays, 320 miles of dock railways, two tidal riverside quays (one destroyed during the war but scheduled for reconstruction) and two deep water jetties providing accommodation for large tankers to discharge and load mineral oils and molasses in bulk. These works cover a distance of seven miles along the river front.

A feature of dock working at Hull is the overside handling of inward and outward traffic. In 1953 nearly 1,500,000 tons were dealt with in this way, representing about 16 per cent. of the total inward and outward tonnage. Excluding fish landings, oil and spirit and coal and coke shipments, 36 per cent. of the inward traffic was discharged overside to lighter or river craft, and about 28 per cent. of the outward traffic was shipped overside to seagoing vessels.

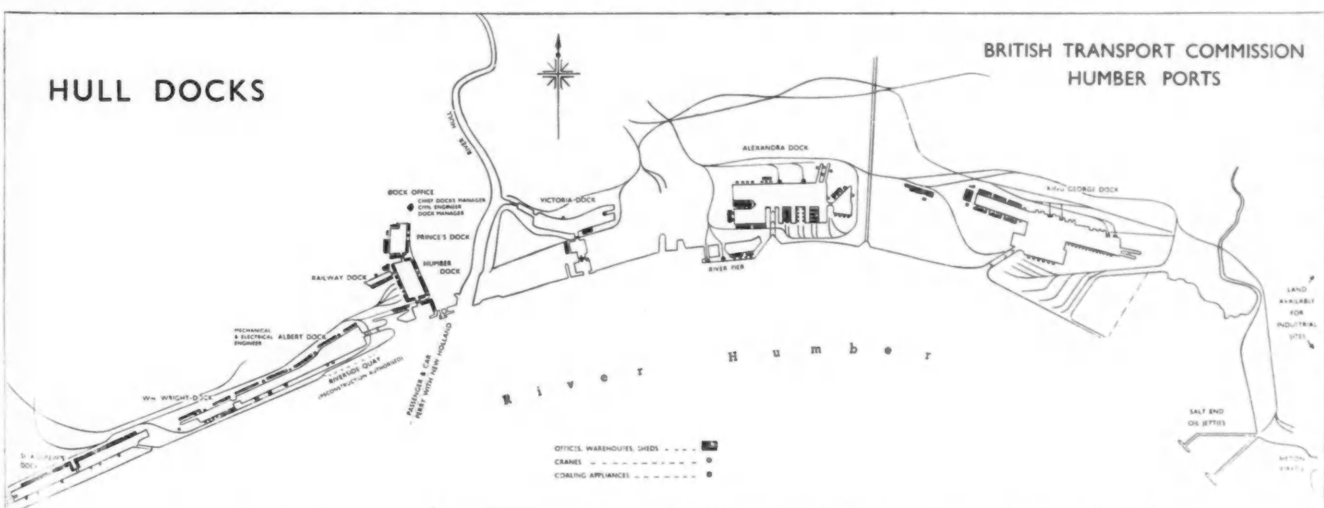
The Older Docks.

By 1829 two more docks, Humber and Princes, had been opened and linked the western end of Queen's Dock with the River Humber. Railway Dock was added in 1846, and all proved a satisfactory commercial proposition in the days when steamers were taking over from sailing vessels. Single storey transit sheds and large blocks of multi-storey brick warehouses of considerable capacity, including bonded accommodation, were built on or near the dock quays, and to-day the Humber and Princes Docks still provide good transit berths for Continental and coastwise regular service vessels.

The first dock to be built on the Humber Bank was the Victoria Dock opened in 1850, which lies to the East of the River Hull and was originally entered from that river. The dock was later extended by the construction of a half tide basin midway along the south side with an entrance from the River Humber. The total water area of Victoria Dock is 25 acres, and it has for many years been a centre of the sawnwood importing trade.

A great deal of damage was suffered on the Victoria Dock estate from enemy action during the war, and at the present time there are two transit shed berths available and two warehouses. In addition, there are ten berths for the handling of timber ships of medium size, and all quays are well served by rail connections.

The bogie system of handling sawnwood from ship to tenancy at Victoria Dock is peculiar to the Port of Hull, and each bogie



Port of Hull—*continued*

carries about 2½ standards of timber on wheels running on the standard gauge railway track. Coupled together the loaded bogies are moved to stacking grounds or storage sidings pending the timber being sorted, stacked or transhipped to rail or road vehicles for delivery to consumers.

Developments along the Humber Bank to the West were begun in 1869 with the opening of the Albert Dock, which lies parallel to the River and is entered through a lock adjacent to the Humber Dock entrance. Albert Dock was extended by the addition, at the west end, of Wm. Wright Dock in 1880. The total area of both is 30 acres, and is principally used by the regular Scandinavian and near-Continental services. Amongst the imports handled are woodpulp, wrapping paper and newsprint, provisions and soft fruit, and there is a steady export trade in building materials, industrial and agricultural machinery, motor cars and heavier road vehicles and railway engines. Both docks were equipped with crane power, transit sheds and warehouses, but suffered heavy damage during the war. As a result of the repairs and rebuilding so far undertaken, there are now nine transit sheds available for traffic, and warehouse accommodation exists in six buildings for the most part situated over transit sheds. A cold store with a capacity of 520,000 cu. ft. is situated at the North West corner of Wm. Wright Dock, and is leased to the Union Cold Storage Company. Further development and modernisation is planned for the South side, Albert Dock, in conjunction with the £2,000,000 Riverside Quay re-building scheme which will be dealt with in detail in a later article in this series. At Wm. Wright Dock post-war improvements have included the construction of an up-to-date crane berth for the speedy handling of such traffics as imported iron and steel ingots and scrap metal and the shipment of iron and steel products of all descriptions. Heavy lifts are dealt with on the South Quay of Albert Dock by an 80-ton Sheer Legs and three 40-ton cranes, and coal shipping and bunkering are performed at three hoists on the South Quay each capable of handling 20-ton railway wagons. Facilities for vessels at Wm. Wright Dock include a Graving Dock (one of the five at Hull Docks owned by the Commission) which has a length of 450-ft. on the blocks, and two side berths each measuring 150-ft. on the blocks.

Vessels discharging overside to barges at No. 22 Bay, Alexandra Dock, Hull. Cotton seed (left) and maize and bagged feeding meal (right).

The Fish Docks.

In the year 1883 St. Andrew's Dock was built and almost doubled in area by the opening of the Extension in 1897. The total water area is 19½ acres, and both docks are used exclusively by the fishing industry. Together they handle more than a quarter of the total fish landings of the United Kingdom, and accommodate some of the largest fishing vessels in the world. Berthing of the trawlers is arranged in turn order of arrival from the West end of the Extension Dock to the East end of the main dock where it is usual for the seasonal Norwegian herring trade to be accommodated. Both docks are equipped with covered quays occupying their North side and measuring 1,780-ft. and 1,400-ft. in length respectively. These quays are from 60 to 90-ft. wide, and provide facilities for the landing, marketing, packing and despatch of fish direct from the trawlers. The total fish landings at Hull in 1953 were 237,021 tons.

Speed is a necessary factor in the handling of this perishable commodity, and electric winches are employed to lift the fish in 5-stone baskets from the trawler hatches. As these are swung inshore they are caught by "bobbers," tipped into kits and weighed to 10-stones net. The fish is then sold by auction, filleted and packed by the merchants and despatched from loading decks to which the fish quays give access on the North side throughout their length. Fifteen train loads of fish leave Hull daily for all parts of the country, and fish landed in the early hours of the morning is normally available in any part of the country the following morning. Merchants' office boxes and kit washing machinery are part of the equipment incorporated in the design of the fish quays.

Most fishing vessels to-day are elaborately fitted and regularly make round trips up to 1,500 miles, and are often away from port for 24 to 28 days, spending much time in Arctic waters. After disposal of their catches on the fish quays on the North side of the docks, the vessels move to the South quays which are equipped with facilities for coaling, icing, rigging or routine inspection and replacement of gear. The coaling appliances consist of four hydraulic pan cranes each of 10-tons capacity and two similar cranes of 5-tons capacity, in addition to a cantilever pan crane of 7-tons capable of coaling two trawlers simultaneously. The ice factories on the dock, which have an annual output of 250,000 tons, replenish the trawlers with crushed ice by overhead belts through chutes rigged at the quay side. The South sides of the docks also accommodate every type of fitting shop required in the service of trawlers, such as net-makers, blacksmiths, carpenters, ropemakers and engineers.

Ancillary industries to the fish trade are sited at the St. Andrew's Docks, and amongst the most modern of these are the extensive cod and halibut liver oil refineries and fish meal and fertiliser factories. Extensive commercial accommodation includes a post office and a bank, in addition to fish merchants' and trawlermen's clubs for the convenience of every type of operative connected with the trade.

At the West end of the Extension Dock are the slipways used when trawlers need underwater repairs or painting. There are four slipways capable of handling trawlers up to 850 tons gross, drawing 16-ft. aft and measuring 171-ft. in length. Occupation of a slipway is usually of short duration, but a special side slipping berth is provided for lengthy repairs, and from No. 4 slipway a trawler can be moved bodily sideways by means of traversing gear on to the side slip where the cradle is lowered by means of jacks, and the trawler allowed to rest on concrete blocks designed to support the keel over the whole of its length. Once the trawler is on the blocks the cradle is returned to the slipway so that protracted repairs do not interfere with normal working.

Port of Hull—continued

Proposals for reconstruction of the slipways to provide facilities for larger vessels are under consideration in collaboration with the fishing trade.

In the vicinity of the St. Andrew's Docks are the fish curing and drying houses which not only prepare kippers from the large quantities of Norwegian herrings landed in Hull, but process cod and haddock fillets for overseas markets. Prior to the war a large area to the West of the docks was laid out as a "Cod Farm," and many tons of fish were conditioned by sun and wind drying: nowadays hot air methods have replaced the old process and extensions to the new plant have been opened on the "Cod Farm" site.

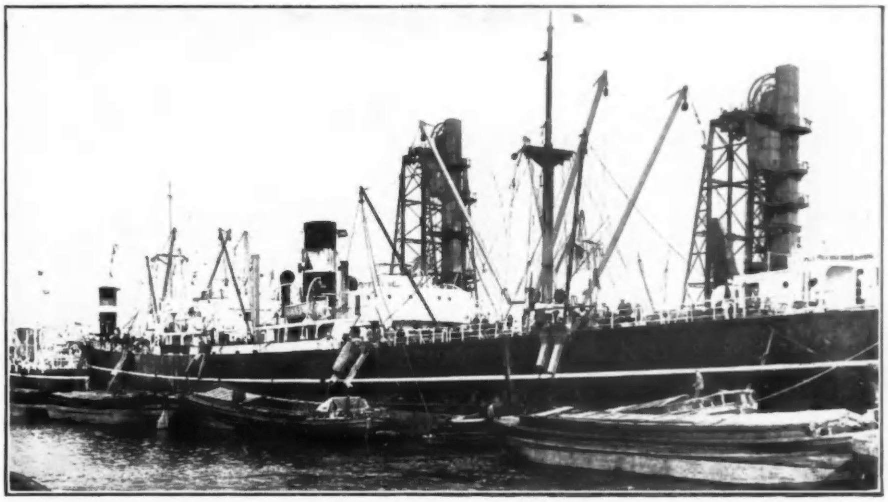
Alexandra Dock.

The Alexandra Dock was the first to be built to the East of the Victoria Dock, and was opened in 1885. An extension was added in 1897 bringing the total water area to 53¾ acres. Nowadays this dock not only deals with deep water vessels, but provides accommodation for vessels engaged in the near Continental fruit, vegetable and provision trades and the Scandinavian timber, paper and woodpulp trades.

The North quay has a length of 1,995-ft. with road and rail transport facilities, cranes and two coal hoists. The shed accommodation on this quay at present consists of one single storey building centrally situated, a transit shed and cold store on the West end having been destroyed during the war. A jetty with rail served quays and a transit shed divides the West end of the dock into two bays which provide berths for the overside working of ships lying stern on to the Western quay. Vessels so berthed can be discharged to river craft on both sides simultaneously. At the South West corner of the dock are two transit shed berths, while from the Lock Entrance eastwards on the South side of the dock three jetties "A," "B" and "C" divide this section into four bays each capable of holding two vessels of up to 420-ft. "A" and "C" Jetties are equipped with transit sheds, and at the "B" Jetty berths are open. All are supplied with crane power, and have rail and road facilities. The East end of Alexandra Dock is bridged in the centre across the 70-ft. entrance to the Extension Dock, which has a water area of 7¼ acres, is equipped with a single storey transit shed, two coal hoists and an open crane berth 530-ft. in length. Rail and road transport serves all quays.

On the North East corner of Alexandra Dock are two graving docks equipped with travelling cranes of 7-tons capacity and 2 derrick cranes of 10-tons capacity. Repairs and overhauls are carried out by local ship repairing firms in these docks.

To the West of the entrance of Alexandra Dock lies the River Pier. This structure reaches 400-ft. into the River Humber, measures 1,300-ft. in length and provides a minimum depth of 18-ft. of water. It is linked with the shore by two main gantries over which run electric coal conveyor belts rated at 600 tons per hour. There is road and rail access to the Pier on which there are



King George Dock, Hull, S.S. "Temple Bar" discharging groundnuts and peanut kernels from Lagos, West Africa.

also two transit sheds which are largely used by vessels bringing Continental fruit and vegetables.

In addition to the electric quay cranes of up to 10-tons capacity, there is a 100-ton fixed crane for dealing with heavy lifts.

King George Dock.

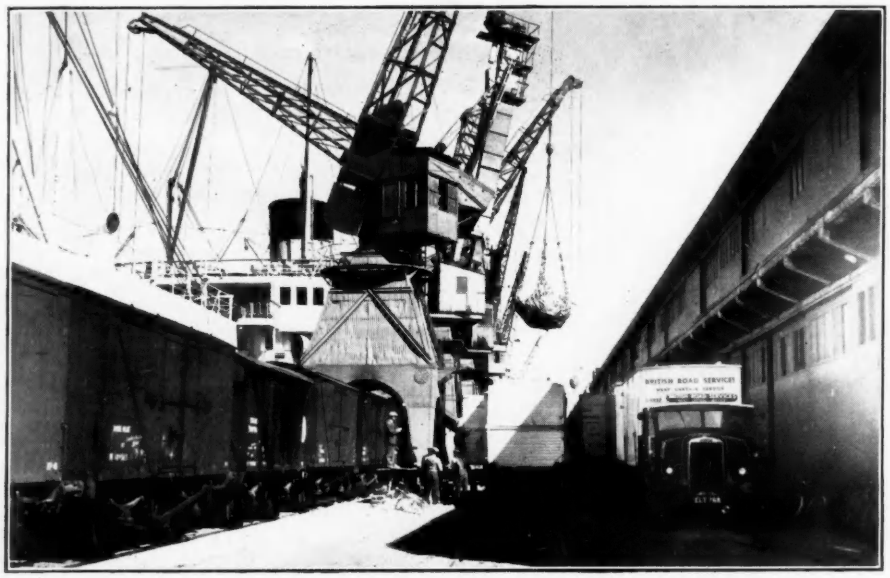
The principal dock in the port of Hull is the King George Dock, opened in 1914. The overall length is more than threequarters of a mile, and although only the two northern arms have so far been completed, the water area is 53 acres. Full development would expand this to 85 acres of water. An 85-ft. wide lock entrance gives access, and there are road and rail connections with all quays, which have a total length of 9,774-ft. The dock lies to the East of Alexandra Dock, and the depth of water on the sill is 32-ft. 11-in. M.H.W.N., which makes it possible for the larger types of cargo vessels to be accommodated.

From the beginning King George Dock has been liberally equipped with electric cranes located at the sheds and on the quays with lifting capacities varying between 30 cwts. and 10-tons. An order has now been placed for 45 new cranes each having a lifting capacity of 6-tons, 70-ft. radius jibs and working at about double the speed of the existing cranes. Other lifting equipment includes an 80-ton floating crane which is self-propelled, and has a maximum height of lift above its pontoon deck of 94-ft.

The North West Arm provides six shed berths, three on the North Quay and three on the South with a total floor area of 237,159 sq. ft. The sheds on the North are

Shipping in the North-West Arm, King George Dock, Hull.

Port of Hull — continued



New Zealand meat being loaded to rail and road transport direct from ship, King George Dock, Hull.

single storey and have loading platforms for both rail and road vehicles. The buildings on the South side of the arm are double storey and give access on the ground level to both rail and road traffic. All these sheds are so constructed that their flat roofs can be used for the reception of suitable cargo and the provision of 30 cwt. travelling roof cranes facilitates the transfer of goods through hatches to the warehouse below, or for delivery to rail or road vehicles behind the sheds. Wool from Australia, New Zealand and South Africa is handled at these berths, and other traffic such as meat, fruit, vegetables and other perishables.

Three of the berths in the North West Arm are equipped with mechanical elevators for the discharge of bulk grain cargoes. These elevators raise grain from the ship's hold and feed it through chutes on to conveyor belts running in tunnels under the quay for conveyance to the 40,000-ton capacity grain silo which stands at the head of the dock. The silo building is constructed in two sections each incorporating 144 bins each measuring 12-ft. x 12-ft. x 50-ft. and holding 140 tons grain. The Silo is capable of receiving 5,000 tons per eight hour day, and delivering 4,000 tons in twelve hours. When grain enters the building it is automatically weighed before storage in the bins. Upon delivery it is weighed through the hoppers of the bins to bulk rail or road vans or coasters or canal barges, or in bags to rail wagons, road vehicles or canal barges.

The North side of King George Dock is provided with three coal shipping berths, two of which are equipped with electric conveyor belts rated at 600 tons an hour, and one with twin coal hoists each with a capacity of 500 tons an hour. These coaling appliances are fed by railway connections with the mineral sidings where coal can be concentrated to ensure continuous operation at peak periods. Other berths on the North side of the dock are specially suitable for the overside working of cargoes such as palm kernels, cottonseed, groundnuts and other types of oilseeds as well as grain of various kinds.

The South side of the North East arm and No. 8 Quay are extensively used for the discharge of pitwood, sawnwood, ores, pig iron, rough copper and scrap metal and for the shipment of machinery, vehicles and other iron and steel products. The No. 12 Quay, 1,356-ft. long, has recently been reconstructed throughout and the road and rail access improved.

At the East end of King George Dock are two graving docks capable of accommodating the largest vessels using the port. Servicing facilities and equipment for repairs are provided by local engineering firms who have premises on the Dock Estate. These docks are served by a 25-ton travelling crane situated on the quay between the two, and each is also equipped with an additional 10-ton derrick crane. Two electric pumps each with a capacity of 36,000 gallons per minute are capable of emptying a dock in one and a half hours, and a vessel can be refloated in three-quarters of an hour.

The King George Dock Estate also includes over 50 acres of open storage ground. An area of about 15 acres near the lock entrance has recently been laid out with four sets of triple rail tracks to facilitate the mechanical handling of pitwood. This involves carrying of the props in slings in dock use railway wagons from ships berths and handling to and from stack by rail mobile cranes.

Salt End Jetties.

The first oil jetty at Salt End, about one mile beyond King George Dock eastwards, was built in 1914 to provide facilities for the growing importation of petroleum in bulk, and a second jetty was added in 1928. These "T" head structures project about 1,500-ft. into the River Humber, and provide a minimum depth of 30-ft. of water at all states of the tide. Deeper drafted vessels are dealt with in favourable tidal conditions, and tankers carrying up to 17,000 tons are regularly berthed. The jetties carry an extensive system of pipe lines to the shore installations which have a tankage capacity of 82 million gallons, about 300,000 tons of oil. Molasses is also received by tanker at Salt End and taken through pipe lines to large distillery works and processing plant producing industrial alcohol, solvents and many by-products. Modern developments in the plastic industry have brought to Salt End the additional business of producing various types of plasticisers.

The Salt End estate is served by road and rail, and in recent years additional sidings have been laid down to speed up the handling of rail tank cars. Considerable use is also made of the inland waterways for the distribution of petroleum products, and besides coastwise and inland shipment from the jetties, the Oil Companies have wharves for the loading of barges on the Hedon Haven which runs across the Salt End estate. Some 464,217 tons of mineral oil were taken as bunkers from Salt End by vessels using the Hull docks in 1953, and an additional 412,982 tons was sent inland by waterway from the Haven wharves.

The Salt End estate includes an area of 770 acres available for development within reach of labour resources, and is suitable for large scale industrial development.

The Trade of Hull.

Bearing in mind the present day importance of exports it is interesting to note the change in relative values between exports and imports through Hull during the last 70 years. In 1882 the value of exports from Hull was approximately 125 per cent. that of the imports. By 1892 the figure had dropped to 79 per cent., by 1900 73 per cent., by 1912 65 per cent. and by 1952 to 50 per cent. In 1938 and 1947 exports stood at only 40 per cent. of the value of the imports, although in 1952 they had risen again to 46 per cent. The figures illustrate not only the decline of exports in common with the country generally, but also the port's progress in attracting inward traffic. In round figures the value of exports to-day is $2\frac{1}{2}$ times that of 1882, whilst the value of imports has increased by more than six times.

Of the total of 19,131,219 tons of traffic handled at the Humber Ports during 1953, Hull dealt with 9,289,362 tons. This was the busiest year since the war, and the following table shows the comparative tonnages of the various commodities handled at the Hull Docks in the last four years, and the number and total N.R.T. of the vessels dealt with:—

Imports.

It will be seen that the heaviest import into Hull is oil and spirit. All classes of oil

Port of Hull - *continued*

including petroleum, gas oil, diesel oil and alcohol are imported direct from the great oil producing countries, but in recent years there has been a fall in overseas traffic and an increase in coastwise cargoes arriving from the refineries opened in this country.

Grain comes next in terms of tonnage and consists of wheat, maize, barley, and oats from Canada, Australia, South America, Russia and Yugoslavia. Much of the grain comes in full ship loads, but often parcels of three thousand and four thousand tons arrive in ships carrying general traffic or timber. The relaxation ot controls on grain has eased conditions in the Silo, and stocks have moved more readily in the last few months. The total import of grain at Hull in 1953 was the highest for five years.

The import of food and provisions has, for many years, been an important feature of the inward shipping trade at Hull, and the intake of fruit and vegetables in prewar days was one of the largest in the country. The bulk of this type of traffic comes into Hull from Europe by the regular Continental services which comprise sixteen weekly sailings and six fortnightly, but considerable quantities of meat and apples arrive in vessels direct from Australia and New Zealand, and oranges, lemons and grapefruit from Palestine, Spain, South Africa, South America, pears and peaches from Italy and bananas from the Canary Islands and Jamaica. Raw sugar has also been arriving at Hull in large quantities.

At the beginning of 1953 stocks began to build up, and after derationing arrivals were at a monthly average of about 20,000 tons.

Pitwood Storage Grounds to the north-east of King George Dock, Hull.

Principal sources of supply were Australia, Mauritius, Cuba and Fiji from which countries a total of 193,000 tons were dealt with during 1953.

The importation of oilseeds and nuts is an important business, and all but a very small percentage of this traffic is dealt with overside to lighters and other river craft for transport to crushing mills on the banks of the River Hull, and at Selby on the Ouse. Following curtailment of the African groundnut scheme arrivals at Hull fell considerably, but in 1953 showed signs of revival, and the year ended with a tonnage figure comprising all types of oilseeds and nuts from Africa, India and the Far East, higher than each of the two preceding years.

Hull is a wool port of long standing, and in the season handles a constant stream of full cargoes ranging up to 20,000 bales each, besides many substantial part cargoes direct from Australia, New Zealand and, to a lesser extent, South Africa. One-third of the wool imported into the United Kingdom has recently been passing through Hull, and in 1953 upwards of 800,000 bales passed through the King George Dock sheds, a record quantity in any one year.

Hull ranks second only to London in the United Kingdom for the quantities of timber handled, and has for many years provided not only accommodation for sawnwood and pitwood discharge, but extensive storage grounds for all classes of timber. In addition to large quantities of both sawnwood and pitwood from Scandinavia and Russia, there has been an increase in recent years in importation of these commodities from Canada, mainly the West Coast. A certain amount of pitwood has also been received from Yugoslavia. Arrivals in 1954 have so far been rather lower than in the previous year, but improvement is thought to be likely as the season approaches its peak. The abnormal quantities of pitwood dealt with in the closing months of 1952 were not repeated in 1953, and recent shipments have been in line with other post-war years. For several years after the war very large quantities of scrap iron and steel destined for the Sheffield area were brought in, mainly from Germany and other Continental countries. These imports have almost ceased, but there has recently been a steady flow of new steel ingots and billets coming in from the Continent, and a marked increase in the arrivals of pig iron from German foundries.

Exports.

By far the largest export from Hull is coal from the West Riding, Nottinghamshire and Derbyshire coalfields. A heavy proportion of the export tonnage goes to Europe, but other destinations include Australia, Argentina, Brazil, Canada, Greenland, West Africa and Egypt. Apart from 1951, each post-war year has witnessed an increase, and

TRADE OF THE PORT OF HULL

	1950 Tons	1951 Tons	1952 Tons	1953 Tons
INWARD				
Building and Road Making Materials	23,703	32,753	21,501	18,882
Fish Landings	212,569	265,776	258,435	237,021
Grain, Flour and Milling Offals	623,646	799,080	786,781	805,673
Food, Provisions, Fruit and Vegetables	381,022	554,326	339,412	499,947
Molasses	176,560	139,723	57,104	44,258
Oilseeds and Nuts	387,551	301,989	263,320	323,424
Ores	81,195	124,061	168,239	160,827
Oil and Spirit	1,650,250	2,011,564	1,878,716	1,713,518
Iron and Steel	396,887	140,452	405,401	328,946
Raw Wool	96,956	83,227	102,874	115,515
Pitwood and Mining Timber	87,065	116,748	252,884	177,259
Other Timber	284,517	590,044	334,935	480,126
Chemicals and Chemical Fertilisers	214,774	208,012	111,641	104,866
Other Commodities	453,573	565,429	385,377	458,325
TOTAL	5,070,268	5,933,184	5,366,620	5,468,587
OUTWARD				
Building and Road Making Materials	7,297	9,195	4,039	9,545
Chemicals and Chemical Fertilisers	20,086	32,356	18,677	10,536
Machinery	49,400	55,093	32,108	33,377
Vehicles	26,648	41,051	33,125	29,736
Tinplate	20	238	1,086	1,143
Iron and Steel Goods	122,207	111,890	87,497	111,640
Oil and Spirit	34,573	405,493	309,715	305,671
Textiles	4,019	1,046	1,379	726
Other Commodities	405,613	348,366	356,994	321,492
	669,863	1,004,728	844,620	823,866
Coal, Coke and Patent Fuel	2,128,356	1,378,102	2,598,368	2,996,909
TOTAL	2,798,219	2,382,830	3,442,988	3,820,775
Total: Inward and Outward	7,868,487	8,316,014	8,809,608	9,289,362
No. and Net Registered Tonnage of Shipping				
No. of Vessels	5,061	5,216	5,418	5,230
N.R.T.	5,545,276	5,449,546	5,895,202	6,504,222
No. of Trawlers	2,404	2,548	2,543	2,606
N.R.T.	383,546	466,850	460,019	455,700

Port of Hull—continued

last year proved to be the best since 1930. Of the 2,996,909 tons shipped at Hull, 1,923,167 tons were for foreign export and 666,984 tons coastwise export, whilst the remainder were mainly accounted for by bunkers for vessels using the port. The upward trend in coal shipments has continued in 1954, and the month of May witnessed the highest tonnage for any month since November, 1939.

Next in importance in terms of tonnage is iron and steel manufactures consisting of a great variety of products from the manufacturing centres of Yorkshire and the North Midlands. In post-war years there has been a continuous flow of motor cars and agricultural tractors and accessories mainly destined for ports in the U.S.A. and Canada, though considerable quantities — mostly tractors—are being shipped to Denmark, Finland and Russia. No fewer than 30,000 vehicles were shipped through Hull during 1953.

There is a fairly heavy movement of grain, flour, oilcake and meal outwards from Hull, much of it destined for coastwise ports, but considerable quantities of the latter two commodities find markets on the Continent. There has also been for many years a steady flow of paint and oils, products of local industry, exported from Hull to a wide range of consumer countries. In fact, Hull is itself a great manufacturing city, and a considerable proportion of its imports serve local industry. By-products of the fishing industry such as the production of fish meal and the refining of cod and halibut liver oils have a large place in local industry, and the manufacture of paint, varnish, animal and poultry feeding stuffs, joinery work, surgical dressings and a wide variety of pharmaceutical products, seed crushing plant, boxes and canisters, chocolates and sweets, besides the older industries of seed crushing and soap making, are amongst the major undertakings of industrial Hull. Most of these have their overseas markets and export direct from the Hull Docks.

For all this inward and outward trade, constant attention to the docks and their equipment is necessary, and the task in recent years has been doubly difficult as the war period left dock authorities heavy arrears of maintenance. In subsequent articles it is hoped to give a detailed account of progress in this work of rehabilitation and development during the post war years and a view of plans for the future of the Hull Docks.

Yugoslav Free Zone in the Port of Salonica

According to a recent issue of "Commercial Information," the Journal of the Federal Chamber of Foreign Trade, the Yugoslav Free Zone in the Port of Salonica will have its full equipment for normal work and will be put into operation in the near future. Thus, after an interruption of 13 years, caused by the war and its consequences, the Yugoslav transit traffic via Salonica will be resumed.

The significance of the Port of Salonica for Yugoslav overseas trade became particularly clear with the beginning of the customs war in 1906 between former Serbia and Austria, at which time the entire overseas trade of Serbia was virtually diverted via Salonica. After the Balkan wars its importance increased and the 1913 Treaty of Alliance between Serbia and Greece provided that the latter "extend all the necessary facilities and guarantees over a period of 50 years for a free export and import trade via the Port of Salonica and over the railway lines leading to Skoplje and Bitolj." The convention on the Serbian Free Zone in the Port of Salonica dated 10th May, 1923, settled in principle the question of Yugoslav transit traffic via that port. The status of individual services in the Free Zone, however, was only established by a special Protocol on 17th March, 1929.

Under the convention mentioned above, Greece ceded to Yugoslavia a part of the area of the Port of Salonica covering an area of 94,000 square metres and an operative quay 292 metres long with a draft of 6 to 8 m. This area forms a part of the Greek territory and is under Greek sovereignty, but the Free Zone enjoys immunity from Greek customs and commercial charges. The jurisdictional and police authority in the Free Zone is exercised by the Salonica Port Commander.

The goods passing through the Zone are not liable to any tax payment or dues or any contributions in favour of the Greek state, or the Salonica municipalities.

Under inter-governmental instruments the Yugoslav Free Zone has a port service under the management of a Yugoslav official. As the Free Zone is a component part of the Port of Salonica, this official is subordinated to the Salonica Port Commander, who is responsible for law and order in the port. The loading and unloading operations are subject to no supervision or interference on the part of the Greek authorities. The Yugoslav Free Zone Direction, or the master of the vessel respectively, are responsible only for supplying the Greek authorities with the most general particulars of the cargo (number and type of bales without declaring the contents).

As may be appreciated from the foregoing, the actual initiation of the Yugoslav Free Zone in 1929 meant an increase in the overall traffic of the Port of Salonica. This increase was maintained during the entire period of activity of the Yugoslav Free Zone between the two wars. During the postwar period, during which the Yugoslav Free Zone was not exploited, this level of traffic has not been attained.

Three considerations are decisive in analysing the future development of the Yugoslav traffic via Salonica and for the character of operations and development of activities in the Yugoslav Free Zone. They are:

(1) Transport considerations;

(2) The stage of development of the areas and transport gravitating to Salonica and the prospects of their further rapid development;

(3) Increasing trade with the Near and Far Eastern countries.

The Morava and Vardar Valleys are the route covered by part of the Yugoslav main railway system on its route from Belgrade to Salonica. Belgrade is practically the same distance from Salonica and the Yugoslav Adriatic ports (somewhat over 600 km.). Almost the whole of Serbia proper and all of Macedonia gravitate towards Salonica.

The opening of the Yugoslav Free Zone in Salonica and diverting of considerable traffic via this zone will mean:

— a decrease in the cost of transport for export and import goods;

— the burden on the Yugoslav railway system will be correspondingly reduced and more balanced;

— conditions will be established for the largest and best equipped Yugoslav port, Rijeka, to resume its former position in the transit traffic to and from Central European countries.

A further favourable factor in the development of traffic is the geographic position of Salonica in relation to the principal ports of the Near and Far Eastern countries.

The rebuilding of the basic plant in the Zone was carried out so that the immediate handling of 300,000 tons of cargo a year became possible. This capacity with a slight extension of the internal railway network can be increased to 500,000 tons.

In addition to open storage space for storing timber, coal and concentrates, warehouses in the Zone are being rebuilt to hold 5,000 or 6,000 tons of general cargo. Among the specific facilities, the old cold storage plant is being rebuilt with a capacity of 90 tons, and preparations are being made for building a new one which will accommodate up to about 500 tons. The necessity for increased refrigeration space has been realised from past experience and there is a possibility of a further increase in the traffic of perishable goods. Yugoslav business circles estimate a regular traffic of about 3,000 to 3,500 tons of dairy and meat products and fruit (both exports and imports).

These arrangements are in the general interest of Greece and Yugoslavia—economically, politically and socially.

Beacons as Navigational Aids

Their Application to Ports and Harbour Approaches

By CAPT. H. V. HART, R.N.R. (Retd.).

(Continued from page 108)

Remarks on Buoyage

It has already been said that the general practice of buoyage may be divided into two different sections, viz.—Outer or Coastal; and Inner or Estuarial. The latter can again be sub-divided as follows:—(a) Landfall and estuary approach buoyage; (b) Sea Channels; (c) Rivers; (d) Isolated dangers and special positions; (e) Wreck marking (which also occurs in outer or coastal buoyage); (f) Marking and lighting of fixed beacons.

Examples of coastal buoyage are the marking by lightships of the Goodwin sands, and the outlying shoals off the S.E. Coast of the U.K. The greater number of major British ports are situated on estuarial rivers, which would offer a considerable menace to shipping in the absence of efficient buoyage. In such geographically situated localities, therefore, the problems of buoyage become two-fold, viz.—to adequately mark the seaward approaches to the channels and rivers leading into the ports; and to buoy those areas with due regard to fluctuating hydrographical conditions, as likely to affect the extremes of size and draft of vessels which may use those ports. As an example, the Thames and its' approaches from the N. Foreland to the Nore present a most complex problem of estuarial buoyage.

As previously stated, responsibility for all buoyage in the U.K. is assumed by the constituted Lighting Authorities, but in certain ports, notable among which are Liverpool and Hull, this Authority for buoyage and lighting, etc., as within their respective areas, is delegated to those local Port Authorities, but sanction for all alterations and new establishments must in all cases be obtained from the supreme Authority, which carries out periodic inspections of all areas under its jurisdiction.

Buoyage and navigational marking present separate and particular problems to each individual Port Authority, according to its geographical situation; hydrographical features; facilities for maintenance and improvements; and volume and peculiarities of the local shipping trades for which it normally provides.

Features of Ports

Ports may broadly be placed within three categories, viz.:—

(1) Those situated on a river, or estuary, distant from open waters, and possessing lengthy and intricate channels to the port through extensive approaches, e.g., London.

(2) Those situated on a river, or estuary, and possessing shorter approach channels into the port, e.g., Liverpool.

(3) Those (usually harbours) situated directly on to open waters, or without appreciable approach channels to the port, e.g., Seaham.

Application of Buoyage to Ports

The first case obviously necessitates an extensive and distinctive system of buoyage and navigational marking, and probably entails as an integral part of such system the addition of one or more lightships. These will be necessary for the following purposes: (a) To provide a substantial and distinctive mark, as a navigational aid, at the seaward entrances to the approaches to the port to assist vessels in making their landfall; (b) to provide efficient and distinctive navigational lighting and fog signals in such positions; (c) to (in certain cases, when moored in channels in salient positions) divide traffic through such channels; (d) for the exhibition (when necessary) of special signals or warnings to shipping, i.e., meteorological information and warnings of wrecks or casualties to buoys, of which immediate report should be made to the Port Authority. In certain cases, lightships are also used for calibration purposes by shipping.

(2) The requirements will permit of considerable modification, and in ports so geographically situated due regard must be paid to the possible provision of existent coastal lighting, in the form of a lighthouse, in the near vicinity of the port which might assist in a reduction of navigational marking, as providing a landfall for the port.

(3) Requirements will be confined to the provision of suitable identification and entrance lighting to the port or harbour.

From the point of view of Port Authorities, navigational marking and lighting may be divided into the following sections:—

(a) Lighthouses—coastal, or situated outside the port, but essentially for the use of vessels entering that port. As all lighthouses are administered by a principal Lighting Authority, it is therefore exceptional for such marks to be one of the functions of a Port Authority. Exceptions are: Point Lynas and Ormeshead Lighthouses, situated on the Anglesey and Welsh coasts respectively, which come under the jurisdiction of the Mersey Docks and Harbour Board.

(b) Buoyage and lighting of sea channels, etc., comprising: Lightship (if necessary), light beacons and buoys.

(c) Lighting of estuary or river, comprising: Small (unmanned) light beacons, buoys and distinctive marking at salient points.

(d) Distinctive lighting at all river dock entrances, stages, jetties, wharves, laybyes, etc.

General Principles of Buoyage

For the purpose of this article, which deals almost exclusively with "floating" navigational aids, the subject of lighthouses is omitted, as forming a separate subject in itself, and reference is only made to the former forms of marks.

In considering the establishment of a buoyage scheme for a port, the primary and essential requirement is to obtain a complete and detailed survey of the entire area to be marked.

This hydrographical work is, in the first instance, performed by the Admiralty Surveying Service, to be re-surveyed at later periods and in greater detail if considered necessary, and charts of such areas are available to all mariners.

In many cases, however, and especially in those of large ports, the estuaries and channels of which are subject to constant and severe fluctuations in depth and direction, it becomes essential to supplement the original work by periodic hydrographic surveys made by the Port Authority, and on a considerably augmented scale. The extent of buoyage necessary, i.e., the numbers and dispositions of buoys, etc., as required for the efficient marking of a channel, largely depends upon its features with regard to its' general and minimum depths; tidal range and velocities; and whether it adopts a straight or sinuous form of waterway. A wide, straight channel requires a minimum number of buoys, but these should always be spaced sufficiently closely together to allow for conditions of thick weather, when the navigator of these channels would require a constant check on his position at short intervals. Navigation of such channels is not usually undertaken when the range of visibility is reduced to less than ½-mile.

Buoys should, as far as possible, be interspaced on opposite sides of a channel.

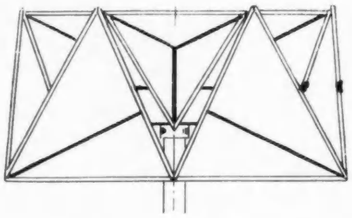
In subsidiary or secondary channels as principally used by coasters and other small craft, and chiefly for daylight navigation only owing to restrictions of widths and depths, it becomes possible to reduce the numbers of lighted buoys by interspersal of (blind) unlighted buoys. This practice, however, is liable to lead to occasional casualties to the latter type and is not to be recommended. For such channels it is customary to use a smaller type of buoy (2nd class) in place of the usual 1st class, 10-ft. based buoy.

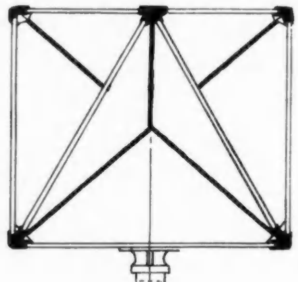
In certain parts of the world the system of central or mid-

Beacons as Navigational Aids—*continued*

channel buoyage has been adopted, consisting of a centre line of buoys only in mid-channel. By this means a great economy is effected in the number of buoys required, but the system possesses the disadvantage of failure to indicate the extreme lateral navigable width of the channel, thereby offering inducement to vessels, and especially in thick weather, to "hug" the buoy line too closely, to the possible result of incurring damage to the buoys. It also adds to risk of collision between opposing vessels and is therefore only to be recommended in cases of exceptionally wide and straight channels.

In certain ports, and as marking a narrow approach channel thereto, and immediately adjacent to shoal water on each side, pile structures are substituted for buoys. These are naturally subject to severe limitation in number and require a stable foundation, and where sudden and extensive fluctuations in depths occur and dredging becomes necessary in the vicinity of the piles, this becomes an operation of some difficulty. This form of marking, however, possesses the advantage of "exactly" denoting the edges of the navigable channel.

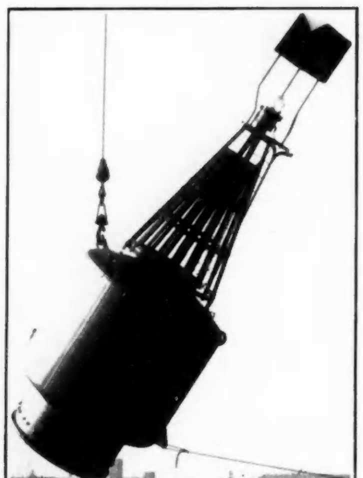




(Right) Octahedral Radar reflector.
reflector.
(Left) Double Pentagonal Radar

Particular Buoyage

In ports subject to maximum tidal ranges and velocities, and where the shipping traffic is largely composed of vessels of great size and having an extreme "Height of Eye" from their bridges, it has been found of great advantage to provide a type of buoy capable of exhibiting a light from a greatly increased focal height, in order to balance the (often) severe inclination of the buoy in a strong tideway. The light exhibited by the ordinary buoy under the above conditions, and especially in cases where buoys are closely interspaced, becomes partly or even wholly obscured to the navigator on a lofty bridge of a large vessel. In certain instances, the buoy has been discovered close under the bow of a vessel without having been previously observed.



By courtesy of Chance-Londex
Electrically operated buoy fitted with Radar reflector.

This has been obviated by the substitution of Boat Beacons for buoys. These beacons are boat shaped and vary in dimensions from 35-70 feet in length; those, however, of the latter size being principally used in connection with special positions and are equipped with a mechanically operated bell or other form of warning. Boat Beacons are internally divided into three water-tight compartments to minimise the results of collision, etc. They carry the appropriate "shapes" of superstructure and a large size lantern, having a focal plane height of approximately 35 feet.

Radar Buoys. Recent progress in the field of radar has provided another valuable addition to navigational aids, in the form of radar reflectors on buoys. Experiments in this direction have been carried on for several years. The initial type of reflector fitted to buoys consisted of a superstructure (of the appropriate shape) of four angled and vertical plates, so arranged as to present a conical form from all points of view. This structure was imposed upon the base of the buoy, and the plates "slotted" towards the base to minimise damage by seas, and were inter-connected by three horizontal interspersed plates. This form of reflector increased the radar range of the modern "ship" set by about 50%. It was, however, found that the returning echo proved too strong, with a resultant "paint" on the screen of the receiving vessel, which became confusing at short range. An improved form of reflector was evolved by the fitting of a cluster of eight corner angles, nested together beneath the surmounting plate of the buoy or fitted above the lantern. This form of reflector has proved entirely satisfactory and is becoming widely adopted by the various Lighting Authorities.

All channel buoys should, as far as possible, be in alignment with one another in order to assist the navigator in steering straight courses in thick weather. Buoys positioned in a bend of a channel should conform as nearly as practicable to a regular curvature. Irregular dispositions of buoys and alignments constitute a risk of danger to both buoys and vessels. It is desirable to uniformly "pinch" a channel for some distance, rather than adopt a practice of irregular buoyage having projections into the channel.

Selections of Types of Buoys

A Lighting Authority, when contemplating a system of buoyage, either partly or in entirety, will first need to give consideration to the following factors:

(a) The general prevailing conditions to which the buoy or buoys will be exposed. These will include maximum wind velocities and heights of seas; depths of water in which moored; velocities of tidal streams and tidal ranges (a velocity of 6 knots is the maximum in which a buoy can be safely moored); the maximum weight of buoy which can be handled.

(b) The types of buoys as required to fulfil stability and sea-worthiness under prevalent conditions; shapes of buoys; whether to be fitted with any special form of superstructure, including topmarks, as relative to wind resistance and damage by heavy seas; whether to be equipped with any form of warning, operated either by wave motion or by some mechanical means; desired focal heights; ranges and and character of lights.

In the selection of types of buoys, due regard will be paid to the volume and particulars of shipping traffic which may be expected to make use of the port, as buoyage will be largely influenced by this factor.

In this selection, it must be recognised that primarily a buoy must be capable of ready recognition both by day and night. By day—by shape and colour; by night—by the colour and character of its light.

The following types of buoys are available for selection:—

Lightbuoys—especially suitable for temporary marking of wrecks, as widely used for that purpose, in harbours and docks.

Lightbuoys—for harbours and rivers and other sheltered waters.

Shallow Buoys—for positions where depths are severely restricted.

Lightbuoys—for harbour entrances, and sea channels, where a certain amount of shelter from severe weather conditions is afforded.

Lightbuoys—for deep and open water positions, i.e., landfall and approach positions, where no protection from weather conditions exists.

Light and Whistle Buoys—for deep sea positions off the approaches to a port.

Lightbuoys—giving some form of audible warning.

These buoys, fitted with a mechanically operated bell, will often be found suitable as substitutes for lightships, as previously

Beacons as Navigational Aids—continued.

established in the channels and approaches to a port. The wave operated bell is unreliable as a warning in sheltered positions.

Marking of Wrecks

This is a most important feature in buoyage, as any inaccuracy or laxity in marking a wreck may result in a serious shipping casualty, and consequent financial loss to the Port Authority on the score of negligence.

Emergency wreck buoys should be kept in an accessible place, in instant readiness for placing on station at the shortest notice. For handiness in marking wrecks in docks, etc., small portable types of wreck buoys are specially useful for temporary marking. It is advisable that buoyage tenders of a Port Authority should be equipped with these, and also with a complete set of wreck marking day and night signals, so that she can at once proceed to a wreck, at the first intimation of such, and take up position as a temporary wreck marking vessel until the final marking can be effected by the appropriate buoy or vessel.

Previous to completion of the latter operation, it is essential to obtain exact information of the "lie" and orientation of the wreck. This must be effected either by careful soundings over the area (in cases where the wreck is invisible) or by examination by divers, or by a combination of both methods.

The wreck mark is always to be placed to seaward of the wreck, but in a tidal waterway, and where much traffic is concentrated, it is often advisable to place an additional mark on the opposite side of the wreck, as a warning to outward bound vessels. This addition is only applicable to spherical or "either hand" marks. In localities of congested traffic, and where fog is prevalent, a wreck marking vessel or bell buoy should always be used, whenever possible, in preference to a buoy of ordinary and appropriate character.

Wreck marks should be positioned as close as practicable to wrecks with, however, due allowance for their swinging radius, with sufficient clearance to avoid fouling of the wreck by their moorings. In "close" waters, wreck vessels should always be moored, i.e., with flood and ebb mooring legs, in order to cover the wreck as closely as possible. In so mooring, care must be taken to avoid fouling the wreck with either anchor or mooring chain.

Whenever removal or "dispersal" of a wreck has taken place, and *before* the wreck mark is removed and the wreck area declared as clear, the most stringent precautions should be observed to ensure that no part of the wreck remains above the level of the sea bed, as charted.

The only really reliable method of obtaining certainty of this depth is that of "sweeping" over the entire area occupied, and in the vicinity of the wreck, by means of a long and rigid steel bar suspended beneath the hull of a vessel, or between two vessels, at the exact depth required. The consequences of any neglect in these precautions may be the cause of a further casualty and extremely serious to the Port Authority.

"Cardinal" System of Buoyage

The foregoing remarks on buoyage almost exclusively refer to that operated on the "Lateral" system, as universally and solely in use in the U.K. The "Cardinal" system, of which the general principles have already been defined, should, however, be understood by the mariner, and therefore a brief description of this system is here given.

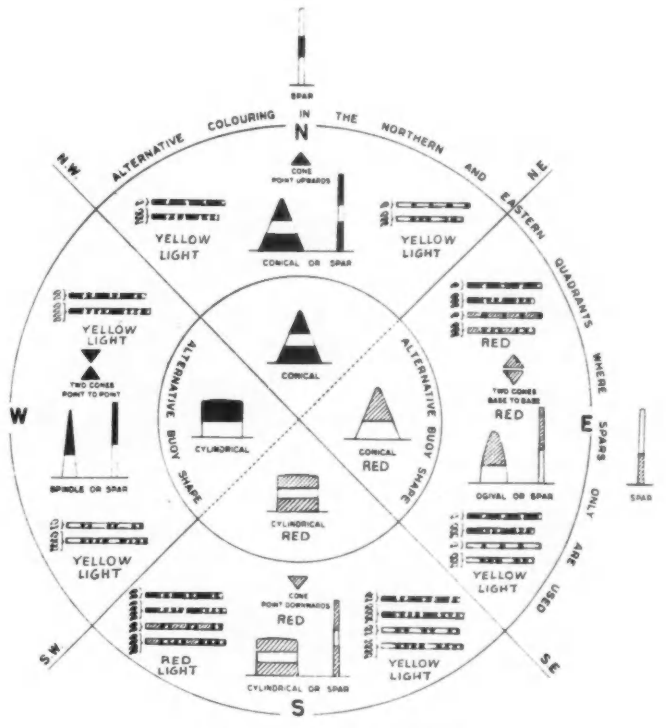
Both Lateral and Cardinal systems may be used in the same country, provided that the limits of their respective use are indicated in nautical documents or, if necessary, by means of appropriate marks.

The principal types of marks in this system are:—conical; cylindrical; ogival; spindle and spar.

The characters of topmarks are:—cone point uppermost; cone point downwards; 2 cones to base; 2 cones point to point.

Characteristic colours are:—black and white; and red and white in horizontal sections.

In order to determine the bearing of a danger from a buoy, the four quadrants of the compass are divided into sectional areas



Cardinal System of Buoyage.

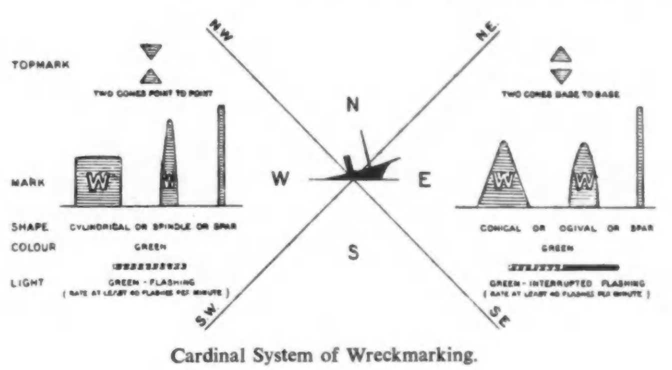
and bounded by the bearings N.E., S.E., S.W. and N.W., taken from the point of danger.

Danger marks in these different quadrants are characterised as follows:—

Northern Quadrant (N.W. to N.E.)—
- Shape or type of beacon—conical or spar.
- Topmark (if any)—cone, point upwards.
- Colour—black, with a wide white median band.
- Light (if any)—white (preferably) flashing or occulting, with an odd number of variations.

Southern Quadrant (S.E. to S.W.)—
- Shape or type—cylindrical or spar.
- Topmark (if any)—cone, point downwards.
- Colour—red, with a wide white median band.
- Light (if any)—red preferably, or white, flashing (preferred), or occulting, with an even number of variations.

Eastern Quadrant (N.E. to S.E.)—
- Shape or type—ogival or spar.
- Topmark (if any)—two cones, base to base.
- Colour—red above, white below.
- Light (if any)—red (preferably), or white, flashing (preferred), or occulting, with an odd number of variations.



Cardinal System of Wreckmarking.

Beacons as Navigational Aids—continued

Western Quadrant (S.W. to N.W.)—
Shape or type—spindle or spar.
Topmark (if any)—two cones, point to point.
Colour—black above, and white below.
Light (if any)—white (preferably) flashing, or occulting, with an even number of variations.

Upon reference to the diagram, this system will become easier of understanding, and it will also be observed that the number of (four) characteristic shapes may alternatively be limited to two, viz., conical shape for the Northern and Eastern Quadrants, and cylindrical shape for the Southern and Western Quadrants.

Marks common to both Lateral and Cardinal systems are:—Isolated danger marks; Landfall marks; Transition marks; Quarantine ground marks; Outfall and spoil ground marks; and those marking areas reserved for military, etc., purposes.

Wreck Marking.—Wreck marks are only placed in the Eastern and Western Quadrants, and are characterised as follows:—

E. Quadrant—
Shape or type—conical, ogival or spar.
Topmark—two cones, base to base.
Colour—green.
Light (if any)—green, interrupted flashing, giving a succession of rapid flashes, followed by a given interval of darkness.

W. Quadrant—
Shape or type—cylindrical, spindle or spar.
Topmark—two cones, point to point.
Colour—green.
Light (if any)—green flashing (rapid,) at a rate of at least forty flashes per minute.

NOTE.—Topmarks are compulsory on the main mark, in order to distinguish the wreck marking buoys of the Cardinal from those of the Lateral system.

Fogbells—Warning Signals for Buoys

In certain districts in which fog is prevalent at seasons, it becomes necessary to include in buoyage schemes for those areas some form of audible warning for shipping navigating therein. Warnings are chiefly required in such positions as: landfalls (in the absence of a lightship); seaward approaches to an estuary of a port; bifurcations of channels; bends of channels; and in certain cases, in the centres of channels for the purposes of division of traffic. Early in the history of navigation, the tolling of a bell was used to afford warning and guidance to mariners during fog, and even to-day this primitive method of warning is in extensive use. This method is operated by the fitting on the buoy or beacon, a bell and pendulum hammers, which swing and strike the bell as the buoy responds to wave motion. The great disadvantage of this method of warning is that, during periods of fog, the sea usually remains comparatively calm and inadequate to operate the bell at the time when most required. Further, even if the bell is sounding, the emission of sound, although a warning of the presence of the buoy, provides no signal in any definite code which would establish identification of the "exact" buoy and its position to the mariner. Recently, however, a warning device has been designed by the A.G.A. Co. of a fog bell capable of emitting signals of distinctive character at predetermined intervals of time—and buoys and light floats so equipped have, in some instances, enabled a Buoyage Authority to replace lightships by this means.

In this device the buoy is equipped with additional CO_2 gas cylinders which lead through a small pipe and drier, and thence through two pressure regulators, which reduce the high pressure of the gas in the cylinders to the required working pressure of the timing and striking mechanism. The latter is operated by the gas pressure similarly to that of the flashers used in this form of gas lighting for buoys. Small charges of gas are released at predetermined intervals, permitting gas at high pressure to "fire" the striker. The usual character of strokes employed is that of a single stroke every 20, 30 or 40 seconds, but in certain circumstances multiple stroke characters can be used.

Whistle Buoys.—An alternative type of warning is in the form of whistle buoys. In these, the sound is produced by the action of the sea in compressing air up a tube, projecting beneath the base of the buoy, in conjunction with the return motion of the buoy, and ensuing release of air. The same disadvantage, however, exists with this type of warning, in connection with weather conditions, as pertaining to the wave operated bell.

Lightship.

Buoys of this type are now produced with the sound warning operated in a similar manner to that of a bell.

Submarine Bell.—Although usually limited to use by lightships, this form of warning can also be fitted to buoys, either separately or in combination with a whistle (and light). As in the case of the ærial bell, the motive power is provided by gas storage; apparatus striking mechanism; and bell. The apparatus is installed inside a chamber, forming the top of a tube, at the lower end of which the bell is secured. The operation of striking the bell is actuated by gas pressure on a plunger, or clapper, as in the case of the aerial bell. For this type of bell, the following characters of strokes are usual: a single stroke every 60, 30, 20, 15, 12 or 10 seconds.

The audible range of a mechanically operated bell varies according to atmospheric conditions, but that of the aerial type extends to a range of 5 miles. The submarine bell far exceeds this range.

Lightships

The principal functions of a lightship are to mark outlying dangers off a coast, in the forms of extensive shoals and sandbanks; and to provide navigational marks for vessels making a landfall or a port. Gt. Britain led the way in the establishment of lightships, the first being placed off the Nore Sand, at the mouth of the River Thames, in 1732. By 1795 four other dangerous shoals, including the notorious Goodwin Sands, had been so marked. These early vessels were of wood and exhibited fixed lights from simple lanterns, the illuminant of which consisted of clusters of candles.

The introduction in 1820 of chain cables ensured additional safety to these vessels, which rapidly developed in size and form of construction, from composite to steel.

The dimensions of a modern vessel approximate to the following: overall length, 137-ft.; beam, 25-ft.; depth, 15-ft.; draught, 11-ft.; tonnage displacement, 500 tons.

Photographs illustrate one of the latest types of vessels, only recently built and placed on station; and an older, but modernised type. In the modern vessel the lantern is carried on a steel lattice work tower amidships, and the source of the electric power to supply current to the light and for ship's lighting is supplied by four diesel engines coupled to generators. Two sets of diesel engines coupled to a generator, and thence to a compressor, supply compressed air to the foghorn (diaphone) and to the winch, or windlass, for working the cables.

The illuminant is generally an electric revolving light, which exhibits characteristic flashes. The optical system is of the catoptric type, and the optic and light beams are maintained in a

Beacons as Navigational Aids—continued

horizontal plane by a pendulum supported on gimbals of designed balance, which neutralises the inclinations of the vessel in a seaway. The optic is revolved by an electric motor, and its speed of revolution can be changed to produce the requisite frequencies of light. The various mirrors in the optic can be set in severally different positions, so that the desired characteristic flashes will be emitted.

Sound Signals.—In connection with these, and with certain atmospheric conditions, there are occasionally to be found in various localities peculiarities which produce "zones of silence" in definite areas, and when navigating within one of these areas a vessel approaching a lightship may find that the horn of the latter, though previously audible at a considerable distance, becomes inaudible upon nearer approach to the lightship, and is not again heard until the vessel is "close to" the lightship.

The different types of sound signals are operated by the following means, viz.:—

(1) By compressed air, comprising: diaphone; siren; reed horn; whistle.

Diaphone—emits a powerful low note, terminating in a descending note (grunt). A tuning mechanism controls the sequence of the operating apparatus, which can be set to give any desired characteristic and length of blast. This is the most general form of audible sound signal used in lightships, and under favourable atmospheric conditions has a range of 12 miles.

Siren—emits a medium powered either high or low note, or more usually a combination of both, in order to increase audibility in changing atmospheric conditions.

Reed Horn—produces a high note. This form of signal has been generally replaced by the diaphone.

Whistle—chiefly in use in buoys. Alternative sources of power are acetylene gas, electricity, wave motion. Emits a low tuned note or whistle.

(2) By acetylene gas and/or electric power: Nautophone (usually by the latter source) is an instrument with a horn, which emits a high note, similar to that of the reed horn.

Submarine Signals—either gas or electrically operated, by bell or oscillator. The former transmits characteristic strokes at predetermined intervals.

The latter (electrically operated) emits a high note signal. Owing to the comparative speeds of sound through air and water, the ranges of submarine signals far exceed those of an aerial nature.

(3) *Wireless.*—These are given out by radio beacon transmitter, and send out during clear weather a radio signal having a definite characteristic, by which the lightship can be identified, and also enables her bearing to be observed by the navigator. A number of these beacons operate from both lightships and lighthouses around the coasts of the U.K.

During thick weather the radio signal is transmitted at precisely the same instant as the diaphone signal begins to sound. By this means the navigator can also estimate his distance from the vessel (or lighthouse) by computation of the difference between speed of sound and that of wireless waves.

By courtesy of Trinity House

Modern Lightship (latest).

(4) *Explosive Signals.*—These are in two forms, viz. (a) by gun, fired from the lightship; (b) by rockets, which explode in the air, and are used in addition to the other audible warning signals.

(5) *Warning of Danger Signals.*—If a vessel is observed by a lightship to be standing into danger, a gun will be fired at short intervals as a warning. An additional warning will be given by day by the hoisting of the code flag signal, "JD", which signifies: "You are standing into danger."

(6) *Off Station Signals.*—When a lightship is no longer on her correct position, or station, she will indicate this by the following:—

BY DAY.—The lowering of the masthead daymarks, which consist of red lattice work spheres. (The Trinity House daymarks are coloured black.)

BY NIGHT.—By the exhibition of a fixed red light at each end of the vessel, with red and white flares shown simultaneously every $\frac{1}{4}$ hour, or, if flares are impracticable, red and white lights will be shown. When off station, the usual riding lights are extinguished.

Weather Signals.—Lightships normally exhibit gale warning and other meteorological signals, the former being:—North cone gale warning: cone point uppermost. South cone warning: cone point downwards. By night: lights in the form of a triangle, to conform to the above.

All lightships are painted red, with the names of their stations on their sides in white.

Moorings

The moorings of all floating beacons form an important part of buoyage, as upon their efficiency depends the correct maintenance of position, and possible safety, both to these and other vessels. In the case of displacement from position, not only does a beacon become misleading in failure to fulfil its allotted function, but a source of danger to shipping, with the possibility of resultant stranding of a vessel.

Lightships.—The general method of mooring adopted for a coastal lightship in open and exposed waters is by a single chain mooring of a scope of 210 fathoms. This long scope of chain provides a constant "catenary" in its length, as a means of prevention from "parting." The sizes of cable vary according to the types of vessels and their respective positions; for those inshore, chain of 1$\frac{5}{8}$-in. in diameter is sufficient, but for more exposed positions 1$\frac{3}{4}$-in. chain is generally used. The anchors used vary in weight up to 5 tons, and the old fashioned stocked anchor has been found to provide better "holding" than the modern stockless type. It is sometimes necessary, if the vessel is found during heavy weather to habitually drag her moorings, to provide a "backing" of chain and additional anchor to her regular moorings.

In "close" and strong tidal waters it is the practice for moorings to comprise flood and ebb "legs," in order that the vessel may continuously maintain her exact position; and if moored in a channel, to prevent streaming across it, during periods of slack water and strong winds.

These moorings, when laid (by The Buoyage Tender), should be stretched as taut as possible, with an allowance of from 8-15 fathoms of slack chain left aboard the lightship. This "slack" is released by her upon completion of the laying of both legs of the moorings.

The lengths of each leg depends upon prevalent weather and other conditions—and vary from 90-120 fathoms for the seaward leg, and from 75-90 fathoms for the inner leg.

Additional anchors and cables are carried by the vessel, as a

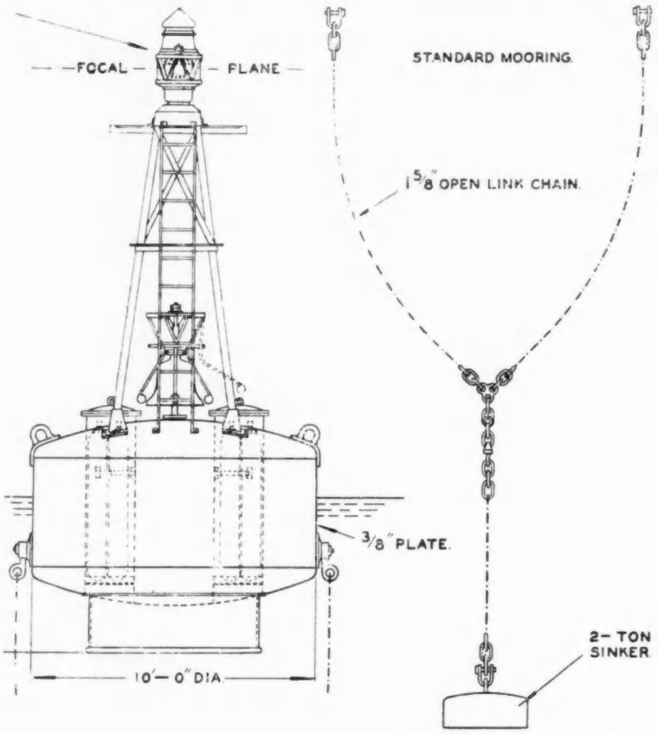
Beacons as Navigational Aids—*continued*

precaution for "bringing up," in the event of the parting of her moorings.

It is essential that the swivel (that of the Bedwell type is preferable) should be kept well greased and that constant observation of the moorings should be made to obviate fouling of the cables (if two legs are used) at times of changes of tide, when the vessel swings in an opposite direction. In cases of fouling, the turns in the cables should be taken out at the earliest opportunity, and this can frequently be effected by the use of a capstan bar, etc., in the swivel.

Lightship chain is usually of the open link type, but studded chain of a special type ("Tayco"), in which the studs form an integral part of the links (instead of the usual welding), is to be recommended as reducing the chances of fouling.

Boat Beacons.—These and other large beacons, and buoys of special type, require a large sinker, which is usually square in form and 50 cwt. in weight. In close and strong tidal waters, or in positions in channels of restricted width, they may be required to



[*By courtesy of the AGA Co.*

Standard AGA buoy and moorings.

be moored with two legs, as in the cases of lightships when anchors in the place of sinkers are used. Large bell boat beacons positioned in exposed positions may be moored with a single anchor and long scope of chain.

Buoys.—The moorings of these vary in length and size, according to the type of buoy and local conditions. An approximate rule for the length of moorings is a length of $2\frac{1}{2}$ times the maximum depth of water in which the buoy is moored. The chain is usually of from $1\frac{3}{8}$-in. to $1\frac{5}{8}$-in. diameter and appropriate to the above conditions, and is shackled to a bridle attached to the two opposite sides of the curtain plate of the buoy. This curtain plate projects below the base of the buoy and provides stability in a seaway, and a means of standing upright in the shore depot and on the deck of the tender. The sinker as generally used for 1st class (i.e., 10-ft. base) buoys is of the "mushroom" type, of 30 cwt.

In assembling all types of moorings for use, it is advisable for all pins of connecting shackles to be "cold" rivetted. Severe weather is the most usual cause of "parting," but long spells of "quiet" cause "hammering" of links and loosening of shackles. In localities where any considerable amount of fluctuations in the nature of the seabed are prevalent, severe "sanding" of moorings and sinker is often experienced, which is liable to pin down the buoy and cause parting of moorings.

Correct maintenance of position largely depends upon good "holding" ground, i.e., the nature of the seabed. Mud and sand are generally good, but hard clay, shingle and rock are unsatisfactory, and the latter may prove a source of continuous difficulty towards maintenance of position of a buoy moored on that form of ground.

It must be noted by the Authority, when laying buoys, and by the mariner, when navigating close to shoal water or some other form of danger, that a buoy swings with a variable radius of from 100-150 feet. This is particularly apparent at periods of low water and in ports in which great tidal ranges exist.

The importance for a Buoyage Authority of maintaining a strict and accurate record of all buoy "fixes" must be stressed, and this can best be effected by the establishment of a "buoy record book", in which a complete "history" of each buoy on station is entered and ready at all times for reference.

Moorings for Vessels, etc.—In many large ports it is necessary for the Port Authority to provide moorings in a river or harbour for various types of craft, ranging from large ocean going vessels, tankers, etc., to barges.

The composition of such moorings with regard to sizes and lengths depends upon the types of vessels and tides and other local conditions. Such moorings (for the large vessels) are generally in the form of four "legs" attached to a heavy central ring, from which the pennant leads to the mooring buoy.

The heaviest moorings ever laid for a merchant vessel were those in the River Mersey, which has a tidal velocity of 5 knots. They were required for vessels of 30,000 tons and consisted of two legs of $3\frac{1}{2}$-in. chain of (each) 120 fathoms in length, and two legs of the same size chain of 90 fathoms. The anchors for these moorings each weighed 10 tons, and the pennant was of $3\frac{3}{4}$-in. chain, and drove through the centre of a very heavily constructed mooring buoy. All Admiralty designed moorings for the largest types of vessels are of specially heavy type.

A general form of moorings for a group of small vessels, and as specially used for destroyers, etc., is a "Trot". This mooring comprises a long ground chain with legs laid out at right angles at intervals, and pennants as suitable to the lengths of vessels for which the mooring was designed.

Another form of moorings as adopted mainly in rivers and harbours where considerable congestion is likely to occur is that of the single buoy, the chain of which is "screwed" into the river bed.

This form is particularly convenient for the temporary accommodation of barges and other similar craft in the vicinity of wharves and quays. *(To be continued)*

Siltation Problem at the Port of New York.

Siltation of sections of the New Jersey and New York waterfront, that ranges up to 17 feet a year, has prompted the Port of New York Authority and the Borough of Edgewater, New Jersey, to make representations regarding the urgent need for the United States Army Corps of Engineers to study the cause and develop plans to assure a solution to the problem. Siltation has already interfered with plans for greater use of waterfront facilities in the area, and a petition is to be submitted to the Public Works Committee of the House of Representatives in the near future requesting authorisation of such a study by the Army Engineers.

The serious effect of siltation at the Edgewater waterfront was discussed by Edgewater and Port Authority representatives earlier this year. Following this meeting, the Port Authority made a preliminary survey of the conditions along both shores of the Hudson River. The survey indicated a rapid rate of shoaling along a large section of the Hudson River waterfront. This has already necessitated heavy expenditure by waterfront industries responsible for maintaining proper depth alongside their piers, as well as by the U.S.A. Corps of Engineers, which is responsible for maintaining the authorised depth in Federal channel projects. In several instances, the heavy expense of maintaining pier slips has resulted in abandonment of plans for greater use of waterfront facilities.

The Port of Agadir

Extensive Improvements Inaugurated

By R. BUTLER

Lying in the broad sweep of a bay on the Atlantic Ocean, the Port of Agadir, in Southern Morocco, is destined to become the second most important port in the French Protectorate. In November, 1953, the French Resident-General inaugurated new harbour installations at Agadir, which thus took another step forward along the road of economic development.

In 1505, a Portuguese by the name of Don João Lopes de Sequiera founded a settlement there and called it Santa Cruz de Cap de Gué. At that time Agadir's only claim to fame was that it supplied small quantities of fish, indigo and hides for export.

For many generations afterwards, Agadir was never anything more than a small fishing village. Then, in 1917, it became part of the French Protectorate in Morocco, and developments and extensions were started.

In 1952, when harbour facilities were much smaller than they are today, 154,000 tons of merchandise were handled by the port and 35,556 tons of fish were caught. As in the 16th century, fishing is still a big source of income for Agadir and sardines canned in the town's factories are exported to many countries. During the first nine months of 1953, the fish catch amounted to over 50,000 tons.

In the fishing harbour of Agadir.

The Port of Agadir, before construction of the new installations.

But Agadir's harbour is not being developed for the fishing industry alone. It is also planned for the handling of agricultural and mineral products. The town is the key to the fertile Souss valley, where irrigation networks are turning a once barren region into a productive area. At present citrus fruits and bananas are being grown in increasing quantities in this rich hinterland, and experiments in sugar cane plantations are showing great promise. Moreover, at the head of the valley, there are rich mineral deposits, among them iron and manganese, and their exploitation will be developed with a view to export through Agadir.

For this latter reason, a railway link from the mining region to the port is under review. New industries, too, are being attracted to the town—among them, an important cement factory which is already operating.

Between 1947 and 1950, important improvement works were carried out. A new jetty and six shore quays were put into service, and a fish market and cold storage plant were built.

A further construction programme was begun in 1950, with the following main objectives: to increase by four times the area of the existing main basin, add 110 yards to the main jetty, build a 1,670-yard transverse jetty, construct 660 yards of quays and a 110-yard slipway for the fishing fleet and, finally, to add 275 yards to the existing jetty quay, allowing for a quayside depth of 30 feet. The work has been undertaken by the Dutch company, Zanen-Verstoep, in association with several French firms.

On November 23 last, General Guillaume inaugurated the new harbour. The greater part of the groundwork has been completed. The transverse jetty is almost finished and the area of sheltered water has been increased to over a hundred acres. Within the port's perimeter some 86 acres of ground have been cleared in preparation for the construction of warehouses and port installations, etc.

Now there are 546 yards of quays at a medium depth, and 273 yards for ships drawing up to 20 feet of water. These facilities are sufficient to permit the handling of about a million tons of merchandise a year. If traffic warrants, the length of quays could be extended in the future by another 1,000 yards. The work has been, and will be, financed mainly out of the French Modernisation and Equipment Fund. The total cost of development to date is just over £2,000,000.

Immediately behind the port rises a steep hill crowned by a 16th century kasbah. The 800-ft. hill and, further north, a 5,000-ft. mountain range, give the port excellent protection from bad weather. Moreover, Agadir's position on the Atlantic coast of Africa will make it a welcome refuge for ships seeking shelter while on the route to Dakar, Nigeria, the Congo and S. Africa.

The original village is located on a narrow strip of land between the present port and the hill behind. The new town, which now has a population of over 30,000, has grown up a little further south, where it has taken on the shape of a horse shoe, due to the curious configuration of the terrain. For the 700,000 people in the rich Souss valley and the regions beyond, Agadir will be the key to prosperity.

Pier and Dockside Fenders

Application of Rubber in Various Types *

By A. R. SMEE, C.B.E., M.I.C.E.

(Continued from page 110)

An interesting system of fendering employing rubber, designed for harbour works in the Middle East, has been developed by Messrs. Rendel, Palmer & Tritton, Consulting Engineers, of 125, Victoria Street, London. In this design steel box-section piles, protected on their seaward face by timber rubbing strips, are employed. These are free-standing, and measure some 50-ft. from sea bed to deck level. At their upper end they are recessed into the face of the jetty in such a manner that the pile head is free to move inwards only. Between the head of each pile and the face of the jetty there is a cylindrical rubber buffer 32-in. in diameter and 32-in. long held in position between steel plates bolted to the jetty structure on one side and to the inner face of the fender pile on the other side. The buffer when inserted is slightly compressed between the fender pile (which is restrained from any outward movement) and the jetty structure.

No Sideways Movement.

The pile heads are a sliding fit between steel side plates rigidly held by heavy bracing on the main structure. In the event, therefore, of a pile receiving a glancing blow, no sideways movement is possible; the pile is driven inwards as by a wedge, against the rubber buffer. The rubber, therefore, acts only in compression, and is not subject to other stresses.

Each fender pile can operate independently, but their arrangement is such that the shock of a vessel berthing is taken by several units together. In addition to their initial compression, the rubber buffers are designed to compress sufficiently to absorb the berthing forces from a vessel of some 40,000 tons displacement.

The rubber buffers are being manufactured by the Leyland & Birmingham Rubber Company, Ltd., of Leyland, Lancashire.

Admiralty Type.

On the north bank of the River Thames, at Dagenham, in Essex, is situated Dagenham Dock, the property of Messrs. Samuel Williams & Sons, Ltd. On their jetties no less than four different types of rubber fendering are employed. The great attention which has been paid to the question of fendering was explained by the firm's chief civil engineer, Mr. R. B. Kirwan, A.M.I.C.E., as being due not only to a natural design to protect their own property, but also to prevent avoidable damage to ships berthing and lying alongside. As Mr. Kirwan pointed out, shipowners will avoid docks and jetties where their vessels are continually suffering damage—a point which is important to dock and wharf owners.

No. 7 jetty, which is the main coaling jetty, is built of unbraced reinforced concrete piles and three systems of rubber fendering have been in use on it for the last four years.

One system, designed in the Civil Engineer-in-Chief's Department of the Admiralty, and generally known as the Admiralty Type, makes use of a unit consisting of a shallow rubber cylinder bonded, sandwich fashion, to top and bottom steel plates (see Fig. 1). The lower plate is attached to the top of the fender pile and the upper plate to the coping of the jetty. Any shock received by the head of the pile is therefore transmitted to the jetty through the rubber cylinder.

The designed deflection of the pile head is 45 degrees of the rubber cylinder in shear, that is, the designed deflection is equal to the thickness of the cylinder, which at Dagenham Dock is 3-in., and this deflection can, of course, take place in any direction. If a larger movement of the pile head is required, this can be obtained by using a rubber cylinder of greater thickness.

Should the pile be hit a glancing blow, it tends to twist, and torsional shear will then be set up. To minimise this, rubber buffers, clearly shown in Fig. 1, are fixed on either side of the pile head, and these limit any rotational movement of the pile.

The success of this type of fendering depends upon the effective bonding of the rubber to the steel top and bottom plates, and, as rubber cannot be bonded to a galvanised surface, other means have to be found for protecting the metal against rust. In this case the plates concerned have been given a thin coating of rubber, which, incidentally, includes the bolt holes. The rubber cylinders in use at Dagenham Dock are the product of the Andre Rubber Company, Ltd., who were also responsible for the bonding to the metal plates and their protective covering with rubber. This system of fendering has been employed in numerous dockyards and harbours.

Dunlop-Williams Type.

The next system of rubber fendering tried out at Dagenham Dock is known as the Dunlop-Williams type, and is the result of collaboration by the two firms concerned. Figs. 2 and 3 show one of these units, which consists of a hexagonal steel casing enclosing a rubber bush in which is embedded a steel tube or stalk. The steel casing is fixed to the face of the jetty, and the inner steel stalk is welded to a steel box which encloses the head of the fender pile. It will be seen that this arrangement permits an all-round movement, including some degree of rotation. A direct inwards movement of up to 4½-in. is possible, and Mr. Kirwan states that this will absorb 20 inch-tons under a normal blow. A variation in the rubber compounds will, of course, allow heavier impacts to be taken, and Dunlops have one design which is capable of receiving 60 inch-tons with a 4-in. deflection.

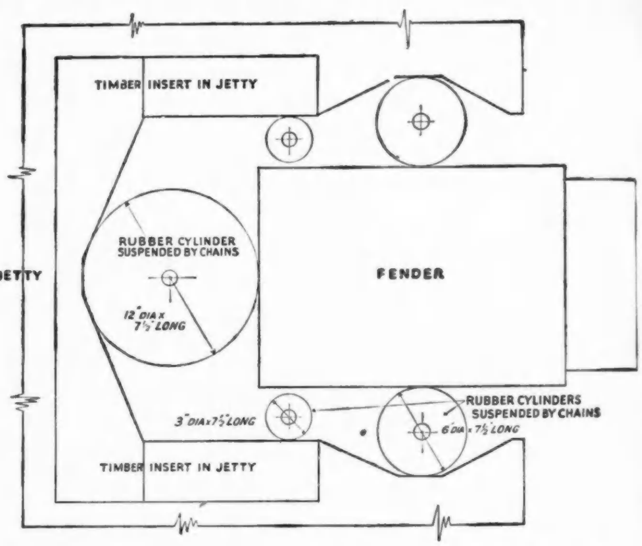


Fig. 4. Cross sectional diagram of a compression cylinder system. This fender is recessed into the jetty.

Compression Cylinder Type.

The third type of fendering to be installed at Dagenham Dock is that known as the compression cylinder type. It was evolved by Mr. Kirwan in collaboration with Dunlops, with a view to the provision of a simple type of rubber fendering which, by obviating the use of any form of steel boxing or steel attachments, would reduce the cost of installation. From the diagram (Fig. 4) it will be seen that the fender pile is recessed into the jetty, and abuts directly on to a cylinder of rubber, whilst secondary rubber cylinders control and restrain sideways movement. The rubber cylinders, which are made by Dunlops, are all 7½-in. deep, the rearmost cylinder having a diameter of 12-in., the main side cylinders being 6-in., and the subsidiary cylinders being 3-in. in diameter. All are suspended by chains or rods. It will be noted that both the rearmost and the main side cylinders are contained in recesses having chamfered sides, and should any rotational movement be imparted to the pile, these cylinders will tend to be rolled into the narrowing angle of the V, and resistance will therefore build up with extreme rapidity. The function of the

(Continued on page 148)

*Reprinted from a recent number of "Rubber Developments."

Pier and Dockside Fenders – *continued*

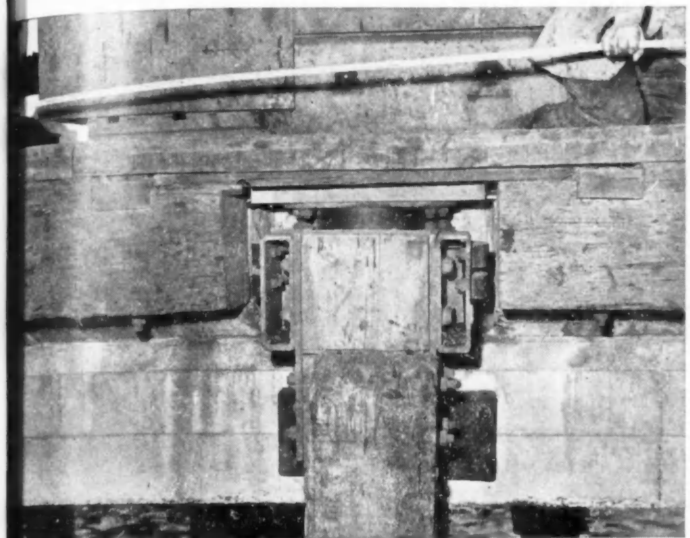


Fig. 1. Front view of the Admiralty type of rubber fendering. The rubber side buffers can be clearly seen.

Fig. 2. The Dunlop-Williams type of fender in use at Dagenham dock.

Fig. 3. Front view of the Dunlop-Williams fender unit.

Fig. 5. Plan view of the compression cylinder system with cover plate removed.

Fig. 6. Front view of the compression cylinder system.

Fig. 7. Goodyear rubber tubing in use as a fender.

Hydraulic Laboratory, New South Wales

Scale Model Investigations by Department of Public Works

By A. B. SINCLAIR, B.E., Supervising Engineer, Hydraulic Laboratory, N.S.W., Australia.

THE dependence of the Australian economy on overseas and coastal trade makes the provision of adequate port facilities of great importance. At the same time the country's primary production and the main city water supplies depend to a large extent on large water conservation projects.

During the 1930's and the Second World War hydraulic models were used for the design of a number of dam spillways including in New South Wales, the Hume, Burrinjuck, Nepean, Wyangala and Oberon dams. However, very little such work was carried out on harbour engineering projects and the use of hydraulic models as a regular design technique has only really come into its own in post-war years, accompanied as it was by an unprecedented boom in civil engineering construction.

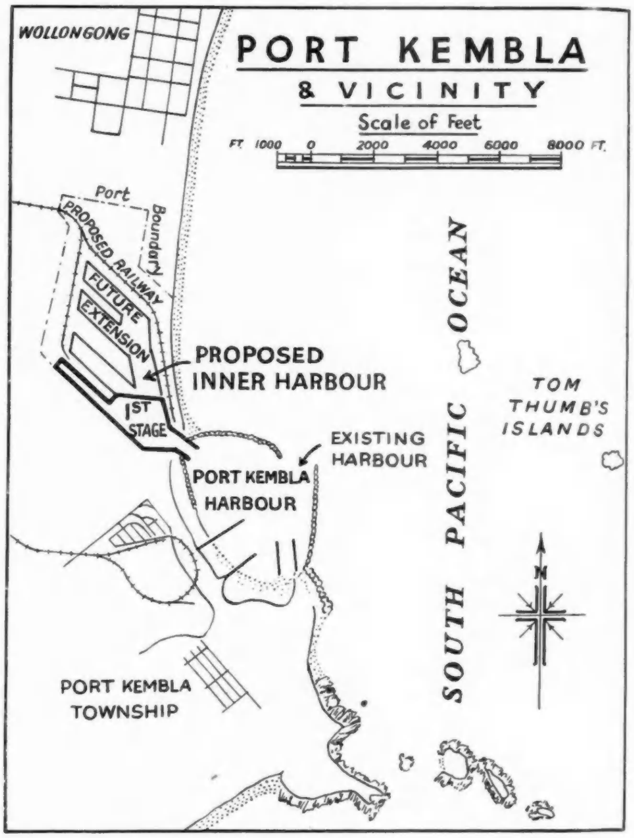
Due partly to the division into states, no one Australian authority has previously had sufficient projects in hand to justify laboratories on the American scale, but the need for research has nevertheless caused a number of authorities to set up permanent hydraulic laboratories. Others work in close touch with the various Universities and utilise their resources of equipment and technical skill.

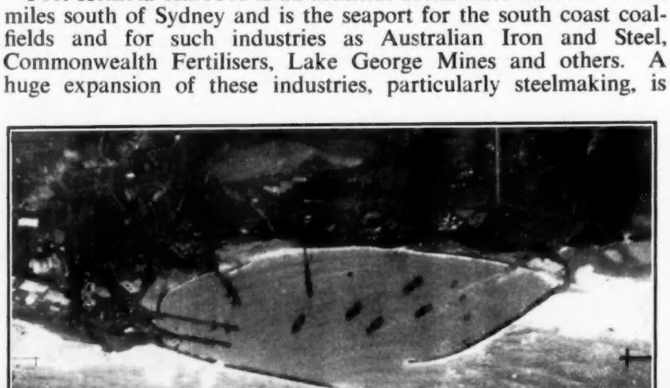
The Department of Public Works, N.S.W., set out in 1949 to investigate by a scale model the problems of wave action in Port Kembla which involved establishing a small research section. Investigations on spillways for dams forming part of the Department's post-war construction programme were added and the present laboratory emerged as a valuable tool contributing to the Department's design and investigation work.

The laboratory is situated at the foot of the now disused reservoir at Manly Vale, adjacent to similar establishments operated by the Sydney Metropolitan Water Sewerage and Drainage Board and the N.S.W. Water Conservation and Irrigation Commission. The reservoir affords a constant and reliable supply of water for testing purposes. Disused settling tanks, formerly part of the old Manly water works, are used for accurate calibration of flow meters.

Investigation of Wave Action in Port Kembla Harbour.

Port Kembla Harbour is an artificial breakwater harbour 44 sea miles south of Sydney and is the seaport for the south coast coalfields and for such industries as Australian Iron and Steel, Commonwealth Fertilisers, Lake George Mines and others. A huge expansion of these industries, particularly steelmaking, is planned, and the provision of adequate, all-weather wharfage is of vital importance.





Aerial view of Port Kembla under storm conditions, June, 1950.

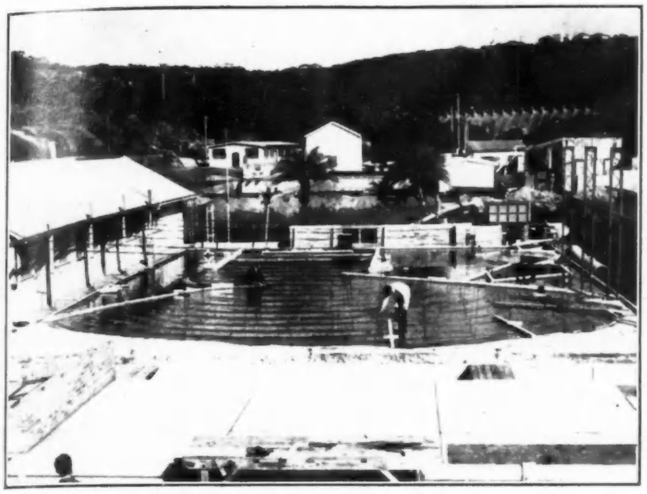
In fine or moderately rough weather Port Kembla is a very good harbour but when severe cyclones rage in the Tasman Sea the ocean swell rolls into the harbour entrance and causes ships to surge about so much that cargo handling is prevented and ships may have to ride out the storm at sea or at anchorage. These conditions prevail for about ten days each year and, at present day operating costs for ships and wharves, represent a considerable financial burden on shippers and on the Port Authorities.

In 1950 the work authorised in the original Port Kembla Breakwaters Enabling Acts was complete and it was still apparent that further protection was required for the harbour. But in the depth of water of the present ends of the breakwaters further extensions cost about £2,500 per foot, so a complete investigation of the problem and the most economical remedies was initiated. This is still proceeding.

The investigation includes detailed study of storm occurrences and corresponding harbour conditions over a number of years, detailed study of the sheltering effect of Tom Thumb's Islands and taking detailed wave height and ship surge records in the harbour during storms. From these studies emerged the fact that only part of the problem is due to short period "sea" waves and that, in addition to these, long period surges or "groundswell" cause trouble to the ships even when the sea surface is smooth.

Two models, one to scale 1:100 and one to scale 1:400 have been constructed in which the action of "sea" and "ground-

Hydraulic Laboratory, New South Wales—continued



Port Kembla Harbour 1 : 100 model; general view.

swell" respectively are being studied. The exact effects of various proposed works on conditions at every berth can be measured and compared. The model has already indicated that the solution will not lie in extensions to the breakwaters only. During the early construction work at Port Kembla stone, too small for use in the breakwaters, was tipped in reclamation walls around the perimeter of the harbour. These walls reflect a large proportion of the wave energy which would have been completely dissipated by the original sand beaches and it appears that the final solution to the problem may be in the form of a combination of breakwater extensions and restoration of spending beaches around the western shore of the harbour.

Features of the models are an electrically driven paddle wave machine and recording wave gauges over the whole area, so that various storm waves can be generated and the wave heights at points in the harbour quickly and accurately determined.

Provision has also been made for reproduction of the proposed Inner Harbour which will be built in the future to provide wharfage for the proposed new blast furnaces and for other industries. In some overseas harbours, notably Capetown, South Africa and Lexios, Portugal, inner basins have experienced very severe range when the ocean swell causes the water in the basin to oscillate as a body.

Following these aspects of the investigation the actual breakwater cross section will be designed by models in a glass sided wave flume. The most efficient and economical sizes and distribution of stone and concrete blocks in the walls to withstand the highest waves will be determined. This flume has already been used for an investigation on the characteristics of wave filters carried out as an undergraduate thesis in a joint investigation with the N.S.W. University of Technology.

Other Harbour and River Projects.

An important investigation recently commenced is that of siltation in Newcastle Harbour, N.S.W. Approximately 2,000,000 tons of silt are dredged annually from this harbour which lies at the mouth of the Hunter River. Prototype studies of this problem are in hand and the investigation will include experiments on a tidal model of the lower Hunter River to be constructed in the near future. Scales proposed are 1:600 horizontal and 1:100 vertical, although the latter may be amended, depending on the bed material to be used. Design of a tide generating machine for this model is being undertaken by the University of Technology as a thesis project.

Arrangements are also being made for a model study of flood mitigation on the Hunter River in the area of Maitland, N.S.W. This city and its environs have been ravaged by many floods in recent years and it is proposed to use the model to assist the determination of stable river channel depths and alignments and the development of an integrated plan of levee bank grades and alignments.

A number of other hydraulic problems involving wave action in harbours and tide and flood currents in N.S.W. coastal rivers await study.

Studies of Hydraulic Structures.

The investigation of dam spillways, outlets and other hydraulic features of water supply works ranks equal in importance with harbour and river studies for the Laboratory. Investigations concluded include design of spillway and energy dissipator for Campbells River Dam being built to augment the water supply for the city of Bathurst, N.S.W., and the testing of an automatic venturi rate of flow controller for country town water treatment works. In hand are model studies of the crest and energy dissipator for Hume Reservoir on the River Murray near Albury, N.S.W., and the diversion tunnel outlet for Adaminaby Dam which the Department is constructing for the Snowy Mountains Hydro - Electric Authority. Future model studies in this field will include a ski-jump spillway for Oberon Dam, N.S.W., and investigation of wave run-up on the upstream face of Adaminaby Dam.

Co-operation with Other Bodies.

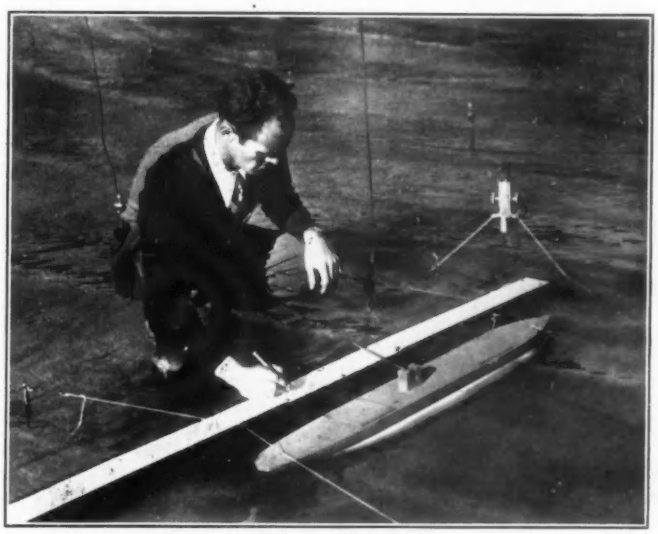
The Laboratory's job is primarily to solve practical engineering problems arising in the Department from time to time, but both practical and theoretical aspects of its work are similar to those facing other authorities. The Laboratory works in close co-operation with the N.S.W. University of Technology on scientific aspects of its work, and as mentioned earlier, two undergraduates are working at the Laboratory on research thesis topics. The Newcastle College of the University of Technology is carrying out a model study on erosion of Stockton Beach and penetration of surges into Newcastle Harbour as a joint University-Department project which is proving to be of great mutual benefit.

Co-operation with other engineering authorities is maintained at both official and personal levels and the Department has both been helped by, and helped, other authorities facing similar problems by a free exchange of information on references, techniques, interpretation of results, etc.

Brief details of the Laboratory's work are communicated to interstate and international bodies from time to time.

Laboratory Facilities.

The working area available for models is 60-ft. x 140-ft. with an 8-in. water supply along one side and drainage channels suitably placed. A steel-frame building with 16-ft. headroom is being erected over this area at the time of writing. Other outside areas are available for harbour and river models. A well equipped general workshop and carpenters shop is adjacent and, in addition, the services of the Department's instrument maker and the central depot and workshops are available when required.



Recording ship model movements, Port Kembla Harbour model.

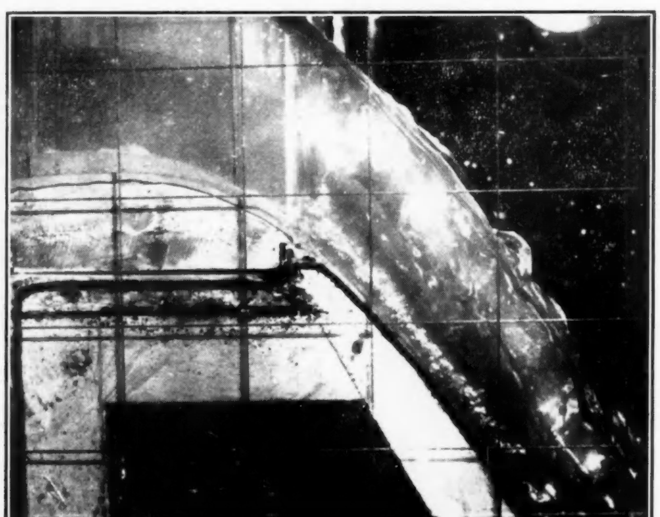
Hydraulic Laboratory, New South Wales—continued

1 : 50 model of spillway for Campbell's River Dam, near Bathurst, New South Wales.

Model construction involves working in a variety of construction media—brick, concrete, timber, perspex and metal, and in addition requires workmanship of high precision for critical sections of models, measuring instruments, etc. Photography plays an important part in recording and evaluating model results and the Laboratory is equipped with a photographic darkroom and still and movie cameras.

For observing and recording results a variety of flow meters, hook and point gauges, manometers, pressure gauges, etc., are used and a Kelvin Hughes four-channel Dynamic Strain Recorder was recently acquired for wave recording and for observing very high speed pressure fluctuations in dam spillway models. A "Pycnosound" for rapid field determination of salt water distribution in tidal estuaries has been made up by adaption from a design developed by the Waterways Laboratory, Delft, Holland, to whom the Department is grateful for advice on this and other matters. The "pycnosound" will be used for study of siltation in the Hunter River. A field wave recorder has also been developed at the Laboratory.

The Laboratory staff includes three to four engineers, draftsmen, technical assistant and workshop staff. The professional staff are divided between those who have specialised in the field of hydraulics and officers of other Branches of the Department seconded for varying periods. In this way the Department maintains a high technical standard and at the same time provides training and experience in hydraulic model work for officers destined ultimately to take their place in construction and administrative work.



Flow over sectional model of spillway of Hume Dam on the River Murray, between New South Wales and Victoria.

A wide and up-to-date index is kept of publications dealing with hydraulics and related fields and a selection of key publications is kept at the Laboratory. Wider library services are provided by the Department's library.

Acknowledgments.
The author is indebted to Mr. J. M. Main, Director of Public Works, N.S.W., for permission to prepare and publish this article.
Photographs are by courtesy of Associated Newspapers, Ltd., and the Public Works Department.

Pier and Dockside Fenders

(Continued from page 144)

smaller side cylinders is to prevent, or rather reduce, any twisting movement of the pile.

Glancing Blows.

The main buffer or cylinder is calculated to absorb 33 inch-tons under a deflection of 6-in., and the 6-in. cylinders can absorb 5 inch-tons of sideways movement. This question of sideways movement is important. Dagenham Dock is used by vessels ranging from 200-ton barges to ships of 11,000 tons displacement; these come into berth both by day and night, and mostly without the aid of tugs. Fender piles may therefore be expected to receive as many glancing blows as those at right angles to the cope line.

It will be seen from both the photographs (Figs. 5 and 6) and the diagram that in this design the rubber acts purely in compression or "rolling compression," and as there is no mechanical connection with either the jetty or the fender pile, absolute failure would appear to be impossible; in fact, even under a smashing blow from some ship wildly out of control, some degree of resilience must still be afforded.

It will be appreciated that in all cases where a fender pile is secured at its top end by some cushioning device, the pile itself must be free standing, and that its seaward face must be protected with rubbing strips sufficiently thick to ensure that even when the pile is pushed into its maximum deflection, the side of the ship remains clear of the coping.

Simple Rubber Tubes.

On No. 4 jetty at Dagenham Dock, which, it is of interest to note, has the distinction of being the oldest concrete jetty on the Thames, rubber fenders are in use which, for absolute simplicity, would seem to be unsurpassable. They consist of 10-in. diameter rubber tubes produced by the Goodyear Tyre & Rubber Company (G.B.), Ltd., through which are threaded chains. As the illustration (Fig. 7) shows, they are draped along the jetty face, and as they are capable of being compressed 7½-in., they afford a valuable degree of protection.

The range of designs of rubber fendering for piers and docksides is considerable, as this and the preceding article have shown. In order, therefore, to cover the subject fairly comprehensively, further notes will be included in a future issue.

Ship Turn-Round at Australian Ports.

The stevedoring industry board has confirmed the shipowners' claims that there has been an appreciable slow-down in the rate of the shipping turn-round in Australian ports this year, although there was steady improvement in 1952 and 1953. In Melbourne the tonnage rate on oversea ships fell from 450 tons a ship daily in late 1953 to 365 tons in the first quarter of 1954. Thus a ship which took four days to turn-round in the latter part of last year was now taking five days to handle the same amount of cargo. Shipowners attribute the slower turn-round to stoppages, obstructive trade union tactics, and shortage of labour.

The Shipping and Forwarding Agent

Comprehensive Service to Importers and Exporters*

By R. ROBBINS, F.S.F.

No doubt the forwarding agent was useful in bygone days—he is even more useful to-day. The fact that he does serve a useful purpose is evident by the number of agents in existence and the extent of their organisations which have increased over the years.

Exacting Clients.

Possibly, you may not know the functions of a shipping and forwarding agent, and I hope to give you some impression of the services provided to their clients. These clients include manufacturers, importers and exporters, government departments such as the Ministry of Supply, Ministry of Aircraft Production, Ministry of Food, War Department, Admiralty and Air Ministry, British and foreign embassies, Crown Agents for the Colonies, The Colonial Development Corporation, zoological societies, film and theatrical companies, missionary societies and numerous other concerns. I mention this short list to show the variety of firms and public and private bodies who make use of the services of shipping and forwarding agents, proving the high esteem in which these agents are held.

Some shipping and forwarding agents have extended the activities of their organisations to meet the demands made upon them by their clients. Some exporters, for instance, do not have facilities at their premises to carry out the packing of their products. This is often a service which an agent undertakes, so he must have available packing warehouse premises, sometimes including casemaking plant, packing experts and also transport for the collection of the goods in their unpacked state. There are varying aspects to an agent's business and many act as warehouse proprietors, thus being in the position to store merchants' goods pending delivery to export steamers or to inland destinations. Many manufacturers have insufficient space in their factories to hold stocks of their products pending completion of orders for overseas markets or awaiting call-off to docks for shipment. To co-ordinate the movement of clients' traffic some agents have the means of transport at their disposal for collection from warehouses or factories, and delivery to docks, either in the shape of road vehicles or river barges. By using barges, as in London, the costs delivered f.o.b. steamer are considerably reduced. Where it is not practical to use barges, road vehicles are used which are often operated by agents. From the clients' point of view, it is desirable and economical for the handling of traffic to remain with their own particular agent, thus eliminating damage and breakages, where numerous transfer points are involved.

Probably an agent established his business primarily for the purposes of completing the necessary documents in connection with Customs clearance of various types of commodities imported and exported by merchants. The services previously mentioned have developed because it was found necessary perhaps to place goods into warehouse for storage, re-packing, grading or some similar operation, on instructions of the owner, and the agent had to employ the use of a warehouse firm and perhaps cartage contractor; therefore control of the consignments became remote. To maintain a firmer control on goods and of course, with an eye to profitable business, many agents bought premises either suitable or readily adaptable as storage warehouses.

An agent has to maintain a staff experienced in every aspect of shipping and forwarding, and in the larger offices, such as the head offices in ports like London, Liverpool, Glasgow and Manchester, departments are set up to handle traffic to or from particular countries or continents. Each department has to know the regulations governing the imports and exports of the country with which it is immediately concerned, and these include an intimate knowledge of consular requirements, particularly for Latin American countries, as failure to complete consular invoices correctly and promptly can have disastrous results from the point of view of the consignees. Knowledge of the types of packing materials which may be used or may not be used to overseas destinations is also essential, thus avoiding serious consequences for consignees.

Licensing and currency regulations have to be borne in mind by both import and export departments, as also have H.M. Customs requirements concerning the relative entries. The Customs tariff needs some understanding, but the import departments of agents have to master this, in order that the correct duty and/or purchase tax is paid on behalf of their clients. Very often clients request agents to meet the invoice cost of goods ordered from abroad, leaving them to arrange collection from foreign factory, complete documentation, cover insurance and generally control the importation, thus relieving the importer of worry in this respect. In the reverse direction the agent can control a shipment on behalf of an exporter, carrying out the formalities from collection at factory to delivered consignee overseas, collecting invoice value of goods against delivery. These arrangements are of course made through the use of accredited agents or correspondents abroad, in some cases foreign branches of the agents employed are available. When a merchant receives an order from a foreign buyer, usually in these days, a letter of credit is established in the merchant's favour with a bank named by him. As is well known, the seller has to conform to the conditions set out in the credit and this is where an agent can assist to relieve the client of worry concerning the documents required. An example of conditions of letter of credit being that bills of lading must be completed to "order," blank endorsed "freight paid" and clean, evidencing goods as—such and such—produced in the United Kingdom; insurance policy or certificate required in duplicate (or triplicate); consular invoice and/or certified invoice.

Issue of Sub-Bills.

These are conditions often laid down; with a copy of the letter of credit in his possession an agent can carry out to the last detail all requirements. Under certain circumstances an agent can issue his own sub-bill of lading, which is often accepted by the banks. This document is issued when a consignment is included on an "omnibus" or "blanket" ship's bill of lading consigned to a shipping agent abroad to avoid minima freights being charged on each respective consignment. This sub-bill of lading or "house" bill of lading as it is sometimes called, is similar to a shipping company's bill of lading, but there is a space provided showing the name and address of the correspondents or agent overseas to whom application for delivery should be made.

Groupage services and truck loads are operated by numerous agents to Continental destinations which allows *pro rata* charges to be levied, showing savings to exporters. Just recently an air groupage service has been started by some agents to certain destinations for the express purpose of showing a saving on normal air rates and of course, all groupages can only operate successfully when sufficient traffic is obtained, but these are generally well supported as some have been given wide publicity.

Nearly all, if not all, agents have arrangements with brokers or underwriters regarding insurance. If a considerable amount of business is given to an insurance company then full cover is offered at reasonable rates but, of course, these vary for different parts of the world. Floating policies or open policies are taken out, and agents can then declare off these and issue their own particular types of certificates which are invariably accepted by the banks.

Specialised Departments.

As mentioned previously, many large offices of agents have sections or departments serving particular areas of the world, but in addition to these, some have specialised departments, dealing with highly selective traffic such as livestock, furs and skins, objects d'art and antiques, exhibition stand fitting, machinery, removals and baggage, and once upon a time specie, and bullion, but this has died out in recent years.

To take one or two of these selective trades and give some idea of the services offered I will start with livestock. Horses and cattle —thoroughbreds and very often prize cattle worth thousands of

* Transcript of a paper recently presented to the Southampton Centre of the Institute of Traffic Administration. Mr. Robbins is a member of the Council of the Institute of Shipping and Forwarding Agents.

Shipping and Fowarding Agent—continued

pounds have to be despatched by the quickest method, in order to arrive perhaps for a particular race or show. Air transport is used very frequently as this mode of travel has least effect upon the beasts and they are usually accompanied by grooms or cattlemen. Special arrangements must be made regarding routeing as livestock must be attended at transfer points during the journeys, for feeding and watering. Veterinary certificates have to be issued, licences obtained for the removal in and out of countries, pedigree certificates have to be produced and numerous other documents taken out to ensure safe acceptance at delivery point.

Valuable furs and skins have operations carried out in warehouse, such as unpacking or unbaling, sorting, grading, sprinkling with naphthalene, to prevent destruction by moth and vermin; and even placed into cold storage. These and other arrangements are made to meet the requirements of a particular community—the fur merchants—who can be very exacting in their demands, especially as they are always in a hurry to obtain imported skins and always expect—which they have a right to do—that their consignments connect with each export steamer to which they are despatched, the governing factor being that the market value is subject to fluctuation, and speed is therefore essential.

Some Agents, as we have seen, are warehouse keepers, and some have premises or part of their premises bonded for special purposes. In Scotland whisky is often bottled in bond in warehouses of shipping and forwarding agents, whilst in London one particular agent had a bonded warehouse for motor cars, up to the commencement of the last war. As so few cars are imported, there is at present no need for a bonded warehouse, but it was the only motor car bond in the country.

For those who are not aware of the use of a bonded warehouse, goods are entered for removal from ship's side to warehouse, without payment of duties, and can either be taken from home consumption in due course upon payment of the appropriate duties or for export, without, of course, payment of duties—the advantage being that the importer does not outlay monies to the Crown until the goods are required for use. The types of facilities offered can depend upon the particular industries in the areas concerned—for instance, in Manchester, the heart of the cotton trade, many agents receive fabrics in bulk (or " lumps " as they call it) from the spinners, and they have the necessary machines installed to wind the materials into rolls. They wrap, label and press pack these rolls into bales, and in respect to the latter process, they, of course, have to know the straining point at which the fabrics would distintegrate. A similar sort of service is performed in the wool towns of Yorkshire, and to anyone outside the shipping profession this may appear strange, but here again the agent has to meet the demands of the industry.

Travel arrangements are usually made with travel agents, which is a business on its own, but since the end of the war, many agents have set up travel offices, to cope with bookings of business executives as well as the general travelling public. The convenience of the traveller is further considered by the agent who operates a baggage department to collect luggage from passenger steamers for delivery to domicile, or into store, and for collecting from domicile and delivery to outward vessels. Some agents act as baggage agents to many steamship lines for the reception of luggage in store, registering, manifesting and subsequent transport to ship's side on day of embarkation. Travel and bagage facilities may not be regarded as essentially those of a shipping and forwarding agent proper, but both services are closely associated with the business and it is doubtful whether there are many who do not offer such services.

The Transit Shed and Modern Goods Handling Methods

New Design at West India Dock, London

By E. S. TOOTH.

In many ports, for a long period of time, it has been the practice where transit accommodation is needed, to erect one shed per berth. The dimensions of the shed have usually been controlled by two factors: (1) the size of the vessels normally using the berth, and (2) the volume of the traffic normally passing across the quay. As the dimensions and carrying capacities of cargo vessels have increased, therefore, the size of dock transit sheds has followed suit.

Particularly in older ports, the need to enlarge premises has often called for engineering ingenuity, and the increase in the size of ships has made it necessary not only to build larger sheds but also to widen quays (to accommodate bigger cranes and heavier setts of cargo) and to improve other facilities, such as rail. Increasing the size of transit sheds has, therefore, frequently involved replanning large areas of dock premises—adjusting building lines maybe, resiting docks roads, and perhaps even constructing false quays. In a busy port, this replanning is often complicated by difficulty in acquiring land to enlarge the dock estate.

Nevertheless, as transit sheds evolved, their main alteration was, until recent years, in size. During the post-war years, however, a new factor developed and transit sheds now being erected are usually also of a different design.

The primary cause of this change is the fuller introduction into port operating work of new-type mechanical handling appliances, particularly the mobile crane and the fork lift truck. These machines are now being employed in ports all over the world, with two objects in view: (1) speedier handling of cargo, and (2) a fuller use of accommodation. In all ports, speed of handling goods inwards and outwards through transit sheds is of primary importance; in most ports the making of maximum use of shed space is essential.

Ships working at the new berths.

Both the mobile crane and the fork lift truck are in general use in the Port of London. They are employed for the reasons already stated, but to be fully effective they must have easy access to the shed and also, once they are inside it, they must be able to work without hindrance.

The Port of London Authority has, since World War II, carried out a big reconstruction programme in all its five systems of docks, and in the process has taken every opportunity to modernise its premises. In the West India Docks, for example, two new berths have been constructed, especially designed to meet not only current working conditions, which include the employment of the new handling appliances, but also, it is believed, working conditions of the future.

When these premises were planned, it was considered that the modern transit sheds should particularly have (1) wide and high doorways—and an adequate number of them, (2) the minimum number of columns or stanchions (if possible, none), (3) a smooth and hard-wearing floor surface, and (4) first class natural and

Transit Shed and Modern Goods Handling Methods—continued

Ground floor view.

artificial lighting. The question of building a loading bank received much consideration. There was a strong case for dispensing with it so that, at the rear of the shed as well as at the front, there would be free access for handling machines. A decision was made to retain the bank (which was included in the first proposals) only because of the particular type of traffic which was expected to be associated with the berth. For *general* work, opinion is now probably against incorporating loading banks, unless there are considerations which prohibit the use of the two machines mentioned.

These machines must also have adequate working space upwards. A standard fork truck has a 12-ft. lift and can, therefore, pile goods up to say 16-ft. high. Mobile cranes can, of course, lift higher and are also particularly useful for loading and unloading vehicles, which in many ports is done inside the shed. For normal transit work, import or export, it is doubtful whether a piling height of much more than 16-ft. or 18-ft. is required, although it is quite feasible, of course, that the standard fork lift truck of the future may have a greater lift than 12-ft. That, of course, may depend upon developments in palletisation.

It would seem prudent, therefore, at a busy berth, to construct the shed at least 20-ft. high and, in order to give reasonable working height for a mobile crane, even a few feet higher. In any case, the extra few feet give appreciably better ventilation for certain classes of goods, such as fresh fruit.

Rear approach for road and rail traffic.

Another point in this connection is that these time- and labour-saving machines do require considerably more floor working space than the hand truck and the powered platform truck; thus there is additional need to pile high on the ground actually allocated for stowage.

A typical transit shed, therefore, is some 400-ft.—500-ft. long (i.e. nearly as long as a 10,000 tons general cargo vessel), some 120-ft. wide and perhaps 20-ft.—25-ft. high. Its doorways, end and side will be 20-ft. or more square, and its floor surface hard-wearing and smooth. Floor gradients, where they are necessary, will be kept at a minimum, bearing in mind the stability of the mechanical appliances to be used in the shed. The tipping factor of a fork lift truck is of particular importance from a safety point of view.

The modern transit shed is fronted by a wide quay, equipped with electric quay cranes of 3-tons and perhaps 5-tons capacity, and of 70-ft.—80-ft. working radius. Usually, too, it is rail-served at both front and rear. Where the traffic warrants, it is economic to build a second transit shed on top of the first.

Three ton cranes at the new berths.

In planning the new berths in the West India Dock, the Port of London Authority decided to erect sheds not only with a second (transit) floor, but also with a third floor to be used as warehousing accommodation. Plans were therefore drawn up by the Authority's Chief Engineer for the construction of two adjacent three-storied reinforced concrete and brick sheds in a layout giving ample working space and facilities for ship discharging and loading, for shed and warehouse work and for deliveries.

These sheds have now been brought into use. The quay is 50-ft. wide and is equipped with two sets of rail tracks and with 3-ton portal quay cranes of the crank-operated level-luffing type, electrically driven on all motions including travelling. The ground floor of each shed measures 432-ft. x 128-ft. x 24-ft. 6-in. high (20-ft. 6-in. minimum to underside of main beams). Doorways are 22-ft. wide by 20-ft. high.

Access on the quay side to the first floor is by a 15-ft. wide verandah, which is, of course, served by the quay cranes. It is not usually convenient to get the somewhat cumbersome mobile cranes up to this level, but the floor is suitable for standard fork lift trucks and platform trucks. Consequently, it is of a good,

Transit Shed and Modern Goods Handling Methods—continued

Cart area between sheds.

smooth, hardwearing surface, there is the minimum number of columns, and the quayside doors are 22-ft. wide. The height to ceiling of this floor is 16-ft. 6-in.

The top (warehousing) floor, also 16-ft. 6-in. high (about 13-ft. under beams), is constructed on the same principle—a 15-ft. wide verandah (which, although set back, can still be plumbed by the long-jibbed quay cranes), a good floor surface and few columns. Fork lift trucks are employed in these warehouses also.

Careful attention was paid also to the facilities at the rear of the shed. The delivery doors and, on the two upper floors, the balconies were again made large enough for easy negotiation by loaded fork lift trucks. The balconies were also staggered.

Travelling electric roof cranes of 30 cwt. capacity serve all rear doors and balconies and also rail tracks alongside the rear of the shed. The cart area between the two sheds is particularly spacious, being 230-ft. long and extending some 200-ft. back from the quay edge. At one end of each shed, on a mezzanine floor above the gear store and the cargo lockup, is a specially designed suite of offices to accommodate the dock operating staff, H.M. Customs and also traders' representatives. These offices, like the cargo floors of the sheds, have excellent natural and artificial lighting.

The illustrations of these premises speak for themselves. It

Rear of sheds, with roof cranes.

remains only to be said that the berths are already proving their outstanding worth. In a port where, because of enemy action, warehousing space has been for such a long time at a premium, the additional floors have proved to be a satisfactory and economic method of providing some 9/10,000 tons of excellent storage accommodation. The transit floors, too, have also proved to be eminently satisfactory, particularly for shipwork. Their "roominess" and easy accessibility have enabled ships' cargoes to be received and delivered very quickly, and in certain instances there have been dramatic increases in handling speeds, due primarily to the mechanised operations which the particular construction of the shed makes possible. For example, outputs of gangs discharging packages of green fruit from ship, are more than 40% greater than those of manual gangs employed elsewhere on the same type of work.

From the operating point of view, the sheds are, in fact, so attractive as to induce experiments in goods handling, and there is little doubt that over a period of time new ideas will be conceived and developed in them which will influence the work in other parts of the port and perhaps even farther afield than that.

Tidal Hydraulics Research

The Committee on Tidal Hydraulics has recently issued its second report, "Bibliography on Tidal Hydraulics." This is intended to be a comprehensive bibliography on the subject, and consists of 836 references, all in the English language, and selected after a review of almost four thousand items.

The report consists of the following eight sections: (1) Theoretical Considerations, (2) Sedimentation, (3) Salinity Effects, (4) Contamination, (5) Regulation and Improvement, (6) Laboratory Experiments, (7) Surveys and Instruments, (8) Basic Physical Data.

Each section is preceded by a brief statement of its scope. As a further convenience to the user, the references are arranged alphabetically under each subject-matter heading (section) and all have been annotated. An attempt has been made to exclude references to material not pertaining directly to tidal hydraulics. For instance, references on sedimentation which are not concerned specifically with the tidal regimen have been omitted because such references are fully covered in the bibliography on sedimentation prepared by the Federal Inter-Agency River Basin Subcommittee of Sedimentation.

The Committee on Tidal Hydraulics was established by the Chief of Engineers, on 20th October, 1948, with the following objectives:

(a) To evaluate the present state of knowledge of tidal phenomena of interest to the Corps of Engineers.

(b) To recommend programmes of study, investigation and research designed to provide the knowledge necessary to arrive at adequate solutions for the engineering problems associated with such tidal phenomena.

(c) To exercise technical supervision of the prosecution of the recommended programmes.

The first Report was published by the Committee in 1950 in fulfilment of the first objective.

Copies of this and other reports of the Committee on Tidal Hydraulics may be obtained from the Recorder, care of Waterways Experiment Station, Corps of Engineers, P.O. Box 631, Vicksburg, Mississippi, U.S.A.

Hydraulics Research in the United States 1954, edited by Helen K. Middleton, National Bureau of Standards Miscellaneous Publication 210, 193 pages, $1.25. (Order from the Government Printing Office, Washington 25, D.C.).

This publication contains information compiled from reports by the various hydraulic and hydrologic laboratories in the United States and Canada. Reported projects include private, university and government supported research. A large number of the projects listed in this volume are reported for the first time.

Projects are reported by title and carry a number which is kept throughout the project history. Other information includes the project sponsor, project correspondent, the nature of the project, a brief description, the present status, results and publications.

New Dry Dock at N. Shields

Largest on the North-East Coast

(Specially Contributed)

The new Smith's dry dock at North Shields, which is capable of accommodating vessels of up to 38,000 tons d.w., is the largest on the North East coast, being 709-ft. long, 95-ft. in breadth at the entrance and having a depth on the cill of 27-ft. at H.W.O.S.T. The two main points which governed its construction were the overriding shortage of dry docks in the United Kingdom, and the increase in the size of merchant ships in the last 12 years. The dock can hold not only the larger dry cargo ships, but also the majority of the biggest tankers in commission or on order.

When it was first proposed, the site was chosen to give a good approach for docking the very large vessels which would use it, and, the location being mostly outside the existing yard of the Company, this choice reduced the disruption of work on repairs to other ships.

The fact that the dock was at an angle to the existing frontage made possible an extension to the existing deep water quay of approximately 400-ft. This gave a total deep water berthage of 25-ft. below L.W.O.S.T. for a total length of about 1,000-ft. To enable this work to be put in hand an existing L-shaped pontoon was disposed of and the moorings were dismantled.

Owing to the nature of the banks of the River Tyne, which rise quite steeply, it was necessary to cut into the hillside to give sufficient length for the dock. The top of the ground at the head of the dock was about 50-ft. above dock cope level (+12.50 O.D.) and about 250,000 cubic yards of earth had to be excavated before work on the dock structure proper could begin. A further 100,000 cubic yards of excavation had to be carried out for the dock proper and other works.

The disposal of this quantity of excavated material was a problem in itself and facilities were given by the Tyne Improvement Commission for the filling in of a dene at their Albert Edward Dock which took the major part of the spoil. Further amounts were taken to the De la Rue site on the Coast Road by arrangement with that Company and the Tynemouth Corporation, and the balance was used as filling to reclaim the area between the new deep-water quay and the new dock wall, this area being on the site of the old pontoon berth.

Before the main excavation could begin, two roads — a private one to the Albert Edward Dock and a public road—had to be diverted with all the various services.

To enable the dock entrance to be constructed, an arched cofferdam was built in the river between the deep water quay extension and the new pump house cofferdam. The riverward end of the site was then dewatered to enable the entrance work to proceed. Whilst the deep water quay and cofferdam were under construction work was also proceeding at the head of the dock and a considerable portion of the walls and floor were built behind the barrier formed by the old river frontage, which was not cut until the cofferdam was closed.

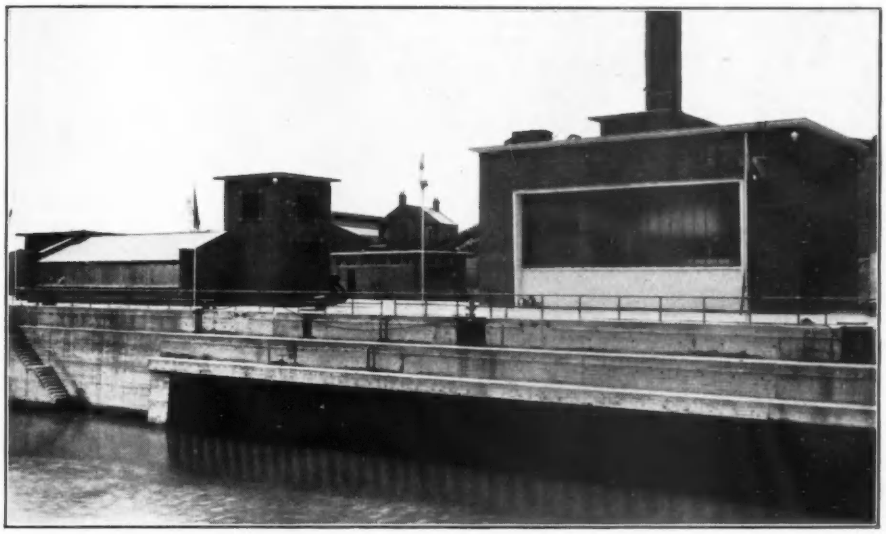
The walls of the dock generally, except the entrance piers, are of steel sheet piling driven into the ground by steam hammers. The top of the dock wall is of reinforced concrete and forms the two top altars for shoring the ships. This concrete top also contains a subway 7-ft. high and about 6-ft. wide in which are placed all the dockside services, such as ballast water, fresh water, compressed air, steam piping and electric cables for all purposes, i.e. welding, dockside lighting, light and power for the ships in the dock and power for the dock equipment.

All service points for these facilities are taken by branches from the subway to boxes on the dock cope at the top altar from which they can be operated. This avoids having cables, piping, etc. crossing the concrete roadway around the dock, which gives complete freedom of travel to the three dockside cranes; one capable of lifting 30 tons at 85-ft. with auxiliary lift of 10 tons at 135-ft., one 5-ton at 85-ft. both on the east side of the dock, and one capable of lifting 5 tons at 40-ft. and 2½ tons at 55-ft. on the west side. The 30-ton crane is capable of serving the deep water quay adjacent to the dock entrance at the limit of its travel. These cranes, which are electrically operated, obtain their power supply from conductor wires which are contained in a trench beneath the concrete surface and on the inside of the crane rail furthest away from the dock cope.

The crane tracks are twin flat-bottomed rails. The dockside rail is carried on the top of the dock wall and the rear rail on a concrete beam.

The pump house is on the west side of the dock and forms part of the entrance pier and is 54-ft. 6-in. x 31-ft. with floor level at −11.0 O.D. It is constructed entirely of reinforced concrete with asphalt tanking and the drainage sump is immediately beneath. The superstructure has a glazed roof and is combined with a transformer house and vacuum breaker room for the syphon breaker gear on the pump discharge pipes. The dock gate winch is also housed in the pump house superstructure, with the operation platform in such a position that the gate operator can see the gate as it is raised and lowered, and also have direct contact with the officials in charge of docking operations.

The pump house also has a gallery above the pump floor which contains H.T. and L.T. switchgear for the whole dock electrical system in addition to the pumps themselves and which forms a complete sub-station.



Pump House superstructure and Boiler House.

Two main 42-in./39-in. horizontal spindle split casing dewatering pumps are installed in addition to three 10-in. drainage and ballast pumps. The equipment is capable of dewatering the dock in 2½ hours. The installation also includes the use of anti-syphon pipes which eliminate the usual sluice and reflux valves.

A 30-cwt. lift sited at the head of the dock operates from dock floor level as well as cope level to the top of the bank 50-ft. above the cope where the Platers' Shed is located. It is contained in a reinforced concrete tower equipped with electric clock and sign. A 70-ft. span bridge from the tower to the top of the bank is constructed of pre-stressed concrete.

The keel blocks are of cast iron with the usual timber cappings.

The dock floor has a longitudinal fall and cross falls on both sides of the keel block line, so as to drain to the sides and to the dock sump under the pump house.

New Dry Dock at N. Shields—continued

The Box Gate.

The dock entrance gate is of the flap or "Box" type and is the largest which has been made to date. It is approximately 7-ft. 6-in. wide and is of cellular form with water and buoyancy chambers, and constructed in mild steel. This design of gate has several features to commend it, and one of these is particularly applicable to the type of river front found on Tyneside.

Where the river bank rises steeply the difficulty and heavy expense in constructing dry docks tends to increase with the length of dock. With a Box Gate hinged on a cill well forward towards the river line and hinging downwards into the river, the space normally occupied by the recesses required to house Mitre Gates when open is available as a useful portion of the dock. It is reasonable to suppose that this saves at least £30,000 in the dock construction of the larger docks.

There is a further saving in the fact that only one winch is required against two gate machines for the mitre gates. The dock operating staff find the principal advantage in the easy operation of the gate, which can be carried out by the gate winchman only, and in rough weather or darkness the difficulty of bringing together a pair of mitre gates is avoided.

The watertight faces of the gate are made by a flat face of dressed greenheart, bearing against a face of specially prepared granolithic rubbed to a smooth and accurate surface. The gate is of the double skin type, with certain compartments freely open to the river, compartments at a higher level maintained watertight to give buoyancy, and other compartments which are tidal. These are so disposed that the load on the winch, either raising or lowering is not excessive, and with the gate lowered to the river bed there is a safe preponderance while vessels pass over it as they enter or leave the dock. The gate is retained in position by specially constructed hinges at either end, and with the arrangement of buoyancy tanks there is not an undue pressure on these hinges. When the gate is closed it is secured by a latch on either side at quay level, easily operated by hand. The gate operating winch is placed at quay level within the structure over the pump chamber, and the wire rope laid in a trench to the edge of the dock. If desired, there is no difficulty in housing the winch in a pit entirely below quay level. The wire rope is led over heavy suitable pulleys to the gate, and through pulleys on the gate across to the opposite side, where it is anchored at quay level. By this simple arrangement there is an economy in the machinery, and the pull on the gate at either side is equalised.

View of dock taken prior to official opening ceremony. At the entrance can be seen the Box Gate described in the article.

The winch is powered by a 65 h.p. D.C. series wound electric motor driving through spur reduction gear to the rope drum. A drum type controller provides a wide range of speed control for raising or lowering the gate. Full potentiometer control is provided on the lowering side.

The time required to operate the gate can be varied by the design of the winch, and this has to take into account the range of tide prevailing. In normal conditions the time for either raising or lowering is three to five minutes.

Deep Water Quay.

The deep water quay is constructed in steel sheet piling with diaphragms at about 40-ft. centres and it is tied back to anchorages in the filled area between the quay face and the S.E. dock wall. It has a concrete coping with the usual mooring bollards and is provided with a service trench for water, steam and compressed air which links with the dock subway. A trench is also provided for electric cables, and service points are provided at intervals along the quay.

To enable ships to be adequately moored at the deep water quay as near as possible to the dock entrance, a reinforced concrete mooring dolphin has been provided west of the dock. This consists of a group of reinforced concrete piles with a heavy reinforced concrete capping and C.I. mooring bollard.

The box-type entrance gate was designed and built by Sir William Arrol and Company, Glasgow, and the dock's three modern electric cranes were supplied by Stothert and Pitt, Limited, Bath. A further crane on the deep water quay extension was supplied by Butters Bros. The adjacent deep water quay is to be extended in the near future, which will increase the length to about 1,300-ft. The pumping equipment was supplied and fitted by Drysdale and Company, Glasgow.

The whole scheme was designed and supervised by Messrs. T. F. Burns and Partners, consulting engineers, London and Newcastle, and the main contractors were Holloway Bros. (London) Ltd., Nottingham.

Bulk Cargo Traffic at Rochester.

A development scheme estimated to cost £200,000 is being carried out by Wm. Cory & Son, Ltd., at their wharf at Rochester, Kent. When completed, the improvements will make their discharging plant in the Medway one of the speediest facilities in the country for the handling of commodities in bulk. The wharf is the only one at Rochester capable of handling bulk cargoes on a large scale. The shipping berth has already been dredged to give a greater depth of water alongside; this will enable the larger ships of up to 4,600 tons d.w., regularly handled at the wharf, to take advantage of the better dispatch given by the faster and larger cranes. Additional hoppers have been installed on the wharf to speed up the rate of discharge of coal from colliers to road vehicles. The renewing of wharf piles is now in hand and this work is expected to be completed towards the end of the year. Next spring, the old five-ton cranes will be replaced by three electric 10-ton cranes of the most modern quick-acting type. The whole reconstruction programme is being carried out in stages to avoid any interruption in traffic, and will be finished towards the end of next year.

Harbour Cut for Airport.

Part of Kingston (Jamaica) harbour is being sacrificed to provide a 7,500-ft. runway for Palisadoes airport, one of the principal air centres in the West Indies. More than 6,500,000 cubic yards of earth are being dragged from the seabed to build up the runway, which stretches out on to land reclaimed from the harbour. It will be 1,150-ft. wide.

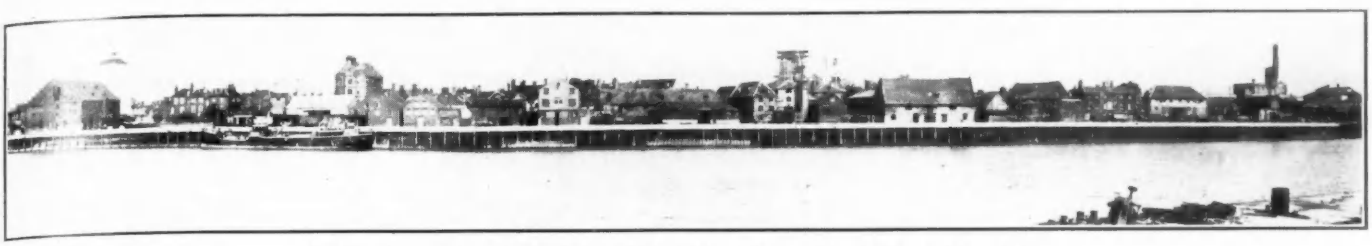


Fig. 1.—View of the completed South Quay from the west bank of the River Ouse.

The Reconstruction of the South Quay, King's Lynn, Norfolk

(Specially Contributed)

Historical.

The site of the South Quay on the East bank of the River Great Ouse at King's Lynn is one of the natural landing places used by ships since the Middle Ages. The first South Quay was constructed of timber in 1855 along a stretch of the river bank then known as Marine Parade. It formed part of the "special works" mentioned in the Eau Brink Act of 1831 as being "deemed necessary to preserve and secure the harbour" following the construction of the Eau Brink Cut.

The old quay was maintained in its original form until the King's Lynn Conservancy Board started a partial reconstruction by driving some new timber king piles along the existing line and facing the old timber sheeting with concrete. This reconstruction, which was being carried out by the Board's staff, came to a standstill on the outbreak of war in 1939.

An inspection of the unrepaired portion of the old quay after the war showed that it had deteriorated to such a dangerous extent that it was deemed both necessary and more economical to construct a new quay wall along a new line in front of the existing face.

The recently completed quay (Fig. 1) is in front of the old quay and extends for the whole length between the Mill Fleet and the Purfleet, a distance of approximately 1,200-ft. Coping and road levels are at 16-ft. above O.D. and berths alongside are dredged to 7-ft. below O.D. Thus small coasters can come alongside at High Water but will ground, as is usual in this area, at low water.

Design

Centre Portion. The bulk of the quay consists of No. 3 Larssen piles in lengths varying between 41-ft. and 44-ft. 6-in. Two No. 12-in. x 4-in. x 31.33 lbs. channel walings are bolted with $\frac{3}{4}$-in. dia. bolts on to the piling for the whole length of this portion at 5-ft. 6-in. depth below ground level. The piling is tied back with 3-in. dia. steel tie rods with turnbuckles at 13-ft. $1\frac{1}{4}$-in. centres to reinforced concrete blocks, 10-ft. x 6-ft. x 3-ft., whose centres of gravity are 6-ft. 6-in. below ground level between 44-ft. 9-in. and 60-ft. 9-in. from the new face piles. The ends of the tie rods bear on to 14-in. x 10-in. x 1-in. plates bolted to the piles or butting on to the concrete blocks.

The intervening space between the old and new quay is back-filled with suitably selected rubble, which allows free percolation of water through $1\frac{1}{2}$-in. diameter weep holes at regular intervals.

The steel sheet piling is capped by a 2-ft. 6-in. deep beam encroaching 1-ft. on to the piles and resting on 3-ft. x 3-ft. x $\frac{1}{2}$-in. trimming angles.

North and South Return End. Owing to the confined space, it was found to be impracticable to use ordinary tie backs, and instead each corner was filled with a weak (12 : 1) concrete supported on reinforced concrete piles. A lighter section No. 2 Larssen pile was used and two No. 9-in. x 3-in. x 17.46 lbs. channel walings at heights of 5-ft. 3-in. and 17-ft. 3-in. from ground level were bolted to the piles.

The concrete filling was covered with either a 1-ft. thick reinforced concrete deck slab or 2-ft. 6-in. of hardcore suitably blinded.

Fig. 2.—View looking north showing nearly completed quay with coping and surge wall.

Fenders. 9-in. x 9-in. x 19-ft. elm fenders were fixed at 10-ft. 6-in. centres for the whole length of the quay and held by three sets of 6-in. x 4-in. x $\frac{1}{2}$-in. angle cleats. In addition two rows of 6-in x 9-in. horizontal elm fenders were fixed at the north and south ends.

Drains and Roadways. Provision was made for the extension of all the existing drains in S.G.W. pipes with double-hinged tide flaps at the mouth. The King's Lynn Corporation undertook to provide a suitable asphalt surface to the new quay, of which the Conservancy Board will bear a proportion of the cost.

Flood Protection. By arrangement with the Great Ouse River Board the steel sheet piles were lengthened and the anchorages suitably strengthened in order to allow for possible scour from the works against fresh water flooding to be constructed by the River Board under the provision of the River Great Ouse Flood Protection Act, 1947.

In addition, a surge wall with a top level of 17.5-ft. O.D. was incorporated into the coping beam (see Fig. 2) with 8 road gullies as part of the River Board's scheme of protective works against a recurrence of the tidal flooding which resulted from the surge of 31st January, 1953.

Construction

Bearing Piles. The original intention was to work from north to south. This programme meant that the north of the quay, in the vicinity of Messrs. Byford's warehouse would have been completed prior to this firm's busy season. Accordingly, work started in April, 1953, with the erection of a gantry for the whole length of Messrs. Byford's north wall. Some 14-in. x 14-in. reinforced concrete piles were driven using a 2-ton monkey, but the vibration was excessive and piling had to be stopped to prevent damage to the neighbouring warehouse.

It was decided to sink "Prestcore" vibrationless concrete piles in lieu of the precast reinforced concrete piles. The necessary negotiations took time, and in order to avoid delay work was started at the south end. A total of 28 precast reinforced concrete piles were driven at this end with a Ransomes & Rapier Dragline, situated on the existing quay. The 2-ton monkey was guided by false leaders fixed to a deck barge suitably anchored. This section of the work was started on May 1st and finished on the 14th June, 1953.

Reconstruction of the South Quay—continued

After various delays, the sub-contractor for the "Prestcore" piles started work on the 16th June. Using four rigs, excellent progress was maintained, and by the 11th July this section of the contract was completed.

Sheet Steel Piling. Owing to the delays at the north end, the Contractor started driving the steel sheet face piles at the south end, working backwards.

In order to obtain the extra reach, use was made of a Ransomes & Rapier Dragline. The No. 2 piles on the south return were driven with a No. 6 McKiernan Terry steam hammer. Steady driving was encountered, and when the No. 3 section piles were reached, the Contractor switched to a No. 9B3 hammer which drove the piles in pairs. Driving was started on 22nd June, 1953, and completed on the 19th December, 1953. The average weekly progress was 40 piles, and the maximum in one week was 64.

Anchorages. The specification required that rail and road traffic on the existing quay should suffer a minimum of interference. This presented little difficulty as far as the anchor blocks were concerned, since the trench for these crossed the railway track at only two places. Excavation for the trench was, therefore, carried out unimpeded with a Backacter, and the track, which in each case was a siding off the main line, was lifted by the British Railways Executive and replaced as required.

The tie rods, however, presented a very different problem. There were 87 of these, and they all ran under the main tracks. Three solutions were possible:

(1) To excavate by hand under the track.

(2) To lift the track at week-ends and excavate by machine.

(3) To use a Mangnall Thrust Borer.

The first two solutions were rejected owing to the cost and delay and it was decided to use a Mangnall Thrust Borer.

Thrust boring consists of probing an underground hole from an existing trench. The hole is made by the displacement and compression of the surrounding earth by means of a boring rod operated by a hydraulically propelled crosshead working on parallel fixed piston rods. The crosshead is driven by a high pressure hydraulic double-acting differential pump at ground level. Extension rods are screwed on to the pilot rod as necessary. When the hole has been bored, a mushroom head is fitted on to the pilot rod and by reversing the crosshead, the rod is withdrawn to the starting point.

There was the possibility that the thrust borer with its relatively short base for alignment and level would not bore to a sufficient degree of accuracy for insertion of the tie rod. Accordingly, for the first two tie rods, the Contractor excavated by machine up as far as the river side of the main track and thrust bored from the anchor trench to this excavation. Results proved satisfactory and for the remaining tie rods, he thrust-bored right through to the existing quay. The maximum error in alignment or level

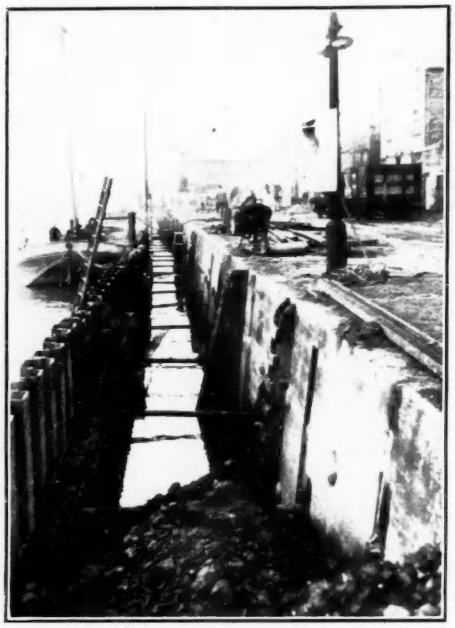


Fig. 3.—View looking north during construction, showing Larssen piling and tie bars.

proved to be 3-in. and, using a 9-in. mushroom, this error was compensated.

In spite of the fact that the thrust borer could develop a pressure of 2-tons/sq. inch (in one case the pilot tube went through a timber king pile) obstructions were met and had to be excavated for and removed. These proved to be mainly concrete anchor blocks from the old quay.

The procedure was as follows:

(1) Fixing, aligning and levelling the equipment in the anchor trench.

(2) Boring the pilot tube until it appeared through a hole already cut in the existing quay.

(3) Threading half a tie rod through the sheet piling and bolting it to the thrust borer mushroom with a special attachment.

(4) Drawing back the tie rod with the thrust borer until the turnbuckle was level with the existing quay.

(5) Threading the second half of the tie rod through the sheet piling and fastening it to the turnbuckle.

(6) Drawing back the tie rod complete.

(7) Taking up any necessary adjustments on the tie rod nut on the face piling.

Stage (5) proved the most awkward, especially when the gap between the new and the existing quay narrowed to 10-ft. In spite of this, steady progress was maintained and the maximum number of tie rods placed in a week was 8.

Backfill. Suitable material for backfill consisting of sand and shingle as dug was obtained from Setch, three miles from King's Lynn. Placing it presented no great difficulties, and the continual rise and fall of the tide greatly assisted in consolidation.

The slurry on the existing river bed was removed by river water jetting with a 3-in. delivery hose from a 5-in. self-priming pump working on a barge. A number of the steel sheet piles were left pitched as the driving proceeded in order to allow for the removal of the slurry. These piles were driven prior to the backfill being placed.

Coping beam and Surge Wall. Progress on this section was slow at first, owing to the difficulty in constructing and erecting the shuttering which was on a curve as well as a batter. Once on the straight, however, the Contractor placed 80-ft. a week, concreting the coping beam and surge wall separately, in 40-ft. bays. Cube tests were taken and these all gave excellent results, the highest crushing stress obtained on 28 days being 6,130-lbs./sq. inch.

"Flexcell" Expansion jointing was used at all the construction joints.

Dredging. At first the Contractor dredged the river bed in front of the new quay by grabbing from the shore with a dragline and tipping it into lorries and barges, working from south to north. It was soon evident, however, that a certain amount of siltation was taking place on the work already completed; arrangements were therefore made to use two machines, working towards each other and obtaining a rough general level. The machines thus went over the ground already covered and removed all high spots.

The Consulting Engineers were Messrs. Wilton and Bell of London and The Dredging and Construction Co., Ltd., of King's Lynn, were the main contractors. The sub-contractors for the Prestcore piling at the north end of the quay were Messrs. John Gill (Contractors), Ltd., London.

New Graving Dock for Singapore.

It was recently announced that excavation work has started on the new Queen's Graving Dock for the Singapore Harbour Board. The building of this dock is the first part of the £1,200,000 modernisation scheme at the Port of Singapore.

The board signed a contract last November with the Malayan Engineering firm of Gammon (Malaya), Ltd., associated with J. C. Gammon (England), Ltd., for the construction of the dock at a total cost of £600,000. Upon completion, it will be the most modern in South-East Asia, accommodation being provided for vessels of up to 26,000 tons. The dock is specially intended for the larger modern tankers.

The dock will be 605-ft. long, 100-ft. wide and 35-ft. deep, and it is estimated that 150,000 tons of rock will have to be excavated. Plans include the installation of two electric pumps to empty the dock of water within an hour; the pumps are to have a capacity of 45,000 gallons a minute. The work is expected to take two years to complete.

The consulting engineers are Coode and Partners, Victoria Street, London.

The Maintenance of Grab Chains

Need for Regular Cleaning and Examination

By A. G. THOMPSON

Types of grabs used vary considerably with the operations they are called upon to perform, and are designed according to the material to be handled, the lifting equipment available, and the local working conditions. Generally speaking, the grabs have either plain jaws or jaws fitted with teeth or tines set at varying intervals. Lifting equipment may be mobile cranes, single and double drum jib cranes, ships' derricks, overhead cranes, runways, transporters, or the normal dockside crane. Whatever method is employed it is essential to remember that the chain used with the grab is as strong as its weakest link.

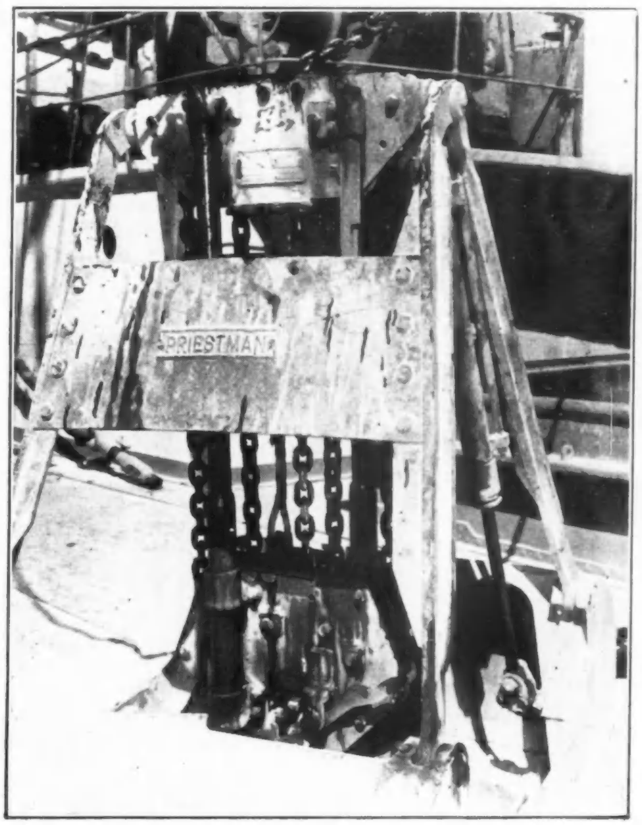
Before the user of grab chains can lay down what is to be done in the matter of their care and maintenance, it is essential to be able to distinguish between steel chains and wrought iron chains. Steel chains are made from bars of the exact diameter, up to and including 9/16-in. For larger sizes the steel bar used is closer to the nominal than the wrought iron chain which is usually at least 1/32-in. oversize. As a rule the links of steel chain are longer and wider than wrought iron chain links when the latter are made to British Standard Specification No. 394 (1949). This, coupled with the smaller size of material used for steel chains results in a reduction in weight of nearly 20 per cent. by comparison with wrought iron chains. On examining machine made steel links it will be noticed that they are usually straighter than hand made wrought iron links. The swell of the weld on one side of the links of steel chains is up to and including $\frac{3}{4}$-in. In larger sizes the weld will be found on both sides of the link and on all sizes the weld is a straight butt joint and not a scarf weld as in wrought iron chain. Further, British Standard Specification No. 1663 (1950) lays down that steel chains shall be marked to show what type of heat treatment they have received during manufacture. To conform with this requirement one firm marks every twentieth link, or links at intervals of 3-ft., whichever is the lesser distance, to show whether the chain has been quenched and tempered, or normalised. Those that have been quenched and tempered are marked "00," and those which have been normalised are marked "0." As a rule, normalised chains are used for sizes greater than $\frac{3}{4}$-in., while quenched and tempered chains are used for $\frac{3}{4}$-in. and smaller sizes.

Grab chains, even under normal working conditions, are subject to more wear and live loading than ordinary sling chains. There is, in addition, the risk that a damaged or worn link or a cracked weld within the grab may pass unnoticed. Naturally the rate of wear varies with the nature of the operation, and thus it is the user alone who can form any idea of the expected length of life of a chain. Sand and gravel grabbing may result in some of the chain links becoming excessively worn in three or four weeks. In the case of grabbing coal the chain should give longer service but it is still necessary to make frequent examinations especially when large coal is being handled. The reason for this is that some of the large pieces when trapped between the jaws of the grab may be crushed while the grab is suspended, causing a slight drop and a consequent shock load, and this may result in an apparently sound weld cracking through the line of the scarf.

The amount of wear which may take place before a link is condemned is not specified by Statutory Regulations but it is generally recognised that when 10 per cent. of the cross section has been lost the link should be replaced. The Ministry of Labour and National Service publish a safety pamphlet (No. 3) entitled "The use of Chains and other Lifting Gear" (H.M.S.O. 1s.) which is a useful guide to those who are responsible for the maintenance of chains. Apart from what the user may do to ensure the safety of the chains he has certain statutory obligations. These are laid down in "The Factories Act, 1937," "Docks Regulation 1934" (S.R. & O. 1934 No. 274): "The Building (Amendment) Regulations 1931" (S.R. & O. 1931 No. 819): and the "Building (Safety, Health, and Welfare) Regulations" (Statutory Instruments 1948 No. 145).

It is obvious that accidents can be reduced to a minimum, and the maximum life of a chain ensured, by the adoption of regular examination, cleaning and lubrication. The examinations should

Dumping single chain grab shown operating on the side of an heap, and the chain leaving the bellmouth at an acute angle.



The internal reeving of the grab chain round the sheaves.

Maintenance of Grab Chains—continued

be dependent upon the conditions under which the grab is working. Dry friction between similar metals will produce excessive wear which, in turn, will produce premature failure. Lubrication will reduce this wear but it is essential that the most suitable lubricant should be employed, that it should be correctly applied, and that it should be used at frequent intervals. The frequency required can be determined by observation to ascertain when the lubricant has become spent. Sand and gravel will cause considerable attrition owing to the abrasive material creeping between the rubbing faces. Wet grinding which takes place with a lubricated chain used in such conditions is preferable to dry unlubricated grinding.

After inspection the chains should be lubricated and further lubrication is desirable if it is found that during working the contact faces of the links appear to be dry. Thus oil or heavy grease are not good lubricants for grab chains. The former breaks down under the extreme pressure conditions, and the latter becomes squeezed away from the faces in contact and is too solid and non-adhesive to return. It will be found that a fairly heavy cylinder oil which will work back between the faces in contact provides the most enduring lubrication at the point where it is needed. It is, of course, in the interests of the user to see that the lubricant is properly applied. As it is needed between the contacting link faces, brushing the oil on the outside of the links is not satisfactory. The best method is to clean the chain when it is out of the grab by washing it in paraffin. It should then be inspected for wear and damage and totally immersed in the lubricating oil. If, however, the chain is in the grab each link will have to be treated by applying the oil with a small brush. Inaccessible joints such as the lower side of a button, a Bordeau Connection, or swivel, or the inside of a shackle must not be overlooked, and unless special attention is given to these points their lubrication will be inadequate.

Attention should also be paid to the effects of annealing. Welds in wrought iron chain may be perfectly sound in appearance and may remain so after the first and second annealing. But the annealing has some effect on them particularly if there is a small slag inclusion in the scarf as this may expand during annealing and produce cracking from the inside. These cracks extend as a result of repeated straining and relaxing. It is for this reason that chain repairers and testers are unable to accept responsibility for any failure of chains after repair. It is advocated that when not in use, chains should be coated with a suitable preservative and put into store.

Finally, there should be instituted a system of records. Each chain should have an identity number and its record should show the dates of fitting and removal, and the quantity of material handled. Data will then be available for comparing chain with chain. The records will give some indication as to when the chains are reaching the normal limit of usefulness and replacements should then be ordered.

Ardrossan Harbour, Scotland

Improvements to Port Facilities

The Ardrossan Harbour Company announce that they have completed the conversion of the Dock Gate and Swing Bridge machinery to electrical operation. The contractors were Sir William Arrol & Co., Ltd., who were responsible for the replacement of the Eglinton Dock Gates in 1949.

Over a period of years the Port of Ardrossan has pursued a progressive policy which enables the Port Authority to offer first class facilities for handling all types of cargo. In the Eglinton Dock vessels up to 8,000 tons dead weight are loaded and discharged by modern electric cranes with lifting capacities between 5 and 10 tons; there are two cranes for handling heavy lifts with a capacity of 30 and 40 tons respectively. At North Montgomerie Pier tankers up to 14,000 tons dead weight are accommodated at a deep water berth with overhead pipelines connected to the oil refinery and bitumen plant operated by Shell Refining and Marketing Co.

New electric capstans supplied by Messrs. Cowans, Sheldon & Co., Ltd., Carlisle, are now in use for the movement of railway wagons at the various berths, and these complete the change over from the old hydraulic system which originally supplied power to cranes and other dockside equipment. The hydraulic power house has been converted into an electrical control centre with transformer house adjoining.

Other improvements in progress include arrangements to increase the iron ore storage space from 20,000 tons to 40,000 tons to ensure regular supplies of ore for Scottish steel works and to overcome seasonal interruptions. It is hoped this additional space will enable Ardrossan to take part in the handling of the iron ore exports from Labrador which are expected to be increased in the near future.

Rapid Iron Ore Discharge.

Ardrossan is recognised as one of the leading ports in the United Kingdom for the handling of scrap iron and steel and discharging rates of 1,000 tons per day from open ships are quite frequent.

For example, the Norwegian steamer "Ringen" (2,164 gross tons), inward from Bordeaux with 3,189 tons of scrap iron, was unloaded earlier this year in 17½ hours on a four-crane berth, at an average rate of 55 tons per crane per hour, the cranes being of the mechanical grab type fitted with flexible knuckles. There was also the Swedish steamer "Idkerberg" from Narvik, with 6,867 tons of iron ore, which, using four cranes, discharged 1,482 tons in four hours.

Recently, the Ardrossan Harbour Company reclaimed four acres of land for lease to the Shell organisation for developments in connection with the rapid handling of road vehicles, and for the building of a block of new offices. Aviation spirit, petrol, white spirit and all grades of fuel oil, some of which are re-exported, are handled at the Shell Company's site. Pipelines are also connected for the bunkering of vessels using the port.

An increase in the present trade with Northern Ireland and Eire of combined harvesters and tractors manufactured by Massey Harris and Ferguson, Kilmarnock, is anticipated by the port authorities. Shipments to Spain and Portugal of agricultural tractors have already been made.

Regular imports of pyrites for the local I.C.I. works at Ardeer are among cargoes handled and with the present demand by industry for sulphur, it is likely that increased shipments of pyrites will be arriving at the port. Another welcome feature is the resumption, after a lapse of some years, of imports of spoolwood used in the manufacture of cotton reels, whilst a steady traffic in limestone from Llanddulas is maintained.

Good rail facilities greatly assist in the handling of passenger traffic, which during the summer season reaches a total of over 300,000; one week-end during the peak season this year over 30,000 passengers used the services to the Isle of Man and Belfast.

Obituary

Dr. E. L. Montagnon, M.I.C.E.

We regret to announce the death early this month of E. L. Montagnon, Ph.D., M.I.C.E. He was 69.

Dr. Montagnon graduated at London University where, in 1917 he gained a Bachelor of Science degree. He was for many years with Messrs. J. Stone & Company, Ltd., and subsequently he joined Messrs. Ransomes & Rapier, Ltd., Ipswich, of which company he became Chief Engineer in 1940 and Technical Director in 1953. He was a member of the Institution of Civil Engineers, and in 1936 he achieved a Ph.D. of London for a thesis on riveted structures.

During his service with Ransomes & Rapier, Ltd., he was responsible for, or largely concerned with, much important work in the field of Heavy Engineering, including the design of sluices for the heightening of the Aswan Dam in 1932 and the sluices for all the more recent barrages undertaken by his firm on the Nile, in India, Pakistan and Iraq, including the Sukkur and Kotri barrages and the great dam at Krishnaraga Sagara.

As a highly skilled mathematician, he was often called upon to apply his science to such varied branches of the art of mechanical engineering as the design of sluices, excavators, heavy railway service equipment and also the design of road-wheel mounted mobile cranes.

Manufacturers' Announcements

New Fourways Electricar

Although specifically designed for loading and unloading from aircraft, this new electric mobile conveyor has almost unlimited applications in speeding up and simplifying operations of this type. The "hinged boom" Fourways Conveyor gives variable loading and delivery heights and is mounted on a standard Morrison-Electricar new type 20 cwt. chassis fitted with 36 cell Exide battery of 240 ampere hour capacity which also provides power to the conveyor unit. The battery box layout gives balanced weight distribution.

Electric Mobile Conveyor.

The 21-in. conveyor track, which is reversible, consists of Renolds 4-in. pitch 6,000 lbs. breaking strain links having attachments welded to each link carrying hardwood slats and is capable of handling units up to 2 cwts. with a maximum load of 6 cwts., at a speed of 50-ft. per minnte. The booms are electro-hydraulically operated, the controls for the conveyor and booms being located in the driver's cab. The platform body has a height of 3-ft. from ground level, and the driver's cab is of the air-view pattern. A tow-bar is fitted, and there is a seat for the loader behind the cab.

This machine is jointly produced by Fourways (Engineers), Ltd., and Austin Crompton Parkinson, Ltd.

New Fire Fighting Tender

A new fire fighting tender with the remarkable foam output of 10,000 gallons per minute and an initial total output of 180,000 gallons without replenishment of foam compound, has been produced by The Pyrene Company Limited at their main works on the Great West Road, Brentford, Middlesex.

This tender is the most advanced example of the modern fire fighting appliances developed by this Company for the protection of oil refineries and storage tank farms.

Built on a Leyland "Hippo" chassis, the new tender has been designed to meet the specifications of a leading oil company for one of their overseas refineries. It carries a bulk supply of 650 gallons of foam-making compound, foam generation being effected by two 700/900 g.p.m. Dennis two-stage turbine fire pumps, each powered by a Rolls-Royce B.80 (160 b.h.p.) petrol engine. Foam compound is induced into the water line by means of built in Inline Inductors. When the inductors are used at full capacity, the tender is capable of discharging approximately 10,000 gallons of stable, high quality fire-fighting foam per minute. Water, at 100 lbs. p.s.i. can be discharged at a rate of 1,960 gallons per minute.

The tender is also designed to feed pre-mix solution of foam compound and water to the fixed foam-making branch pipes on the side of storage tanks. The pre-mixing is achieved by means of the inductors.

Dredger for Port Talbot

The British Transport Commission's South Wales Dredging Fleet has recently been augmented by the delivery of the dredger "Kenfig" to Port Talbot. The "Kenfig" is a single screw diesel propelled twin grab hopper dredger, 156-ft. long x 34-ft. beam. The craft was built by Messrs. Henry Scarr, Ltd., who are controlled by Messrs. Richard Dunston, Ltd., of Thorne, Yorkshire.

The dredger is designed to carry a spoil deadweight of about 800 tons on a mean draft of 12-ft. 6-in. and 670 tons on a draft of 11-ft. 6-in. The hopper well admidships is 56-ft. in length. There are 10 hopper doors controlled by the B.T.C.'s latest design of hydraulically operated door lifting gear. The hopper door hydraulic equipment, together with the hydraulic steering gear has been manufactured by Messrs. Vickers Armstrong, Ltd.

The dredging apparatus supplied by Messrs. Priestman Brothers, Ltd., Hull, consists of two diesel driven grabbing cranes of the firm's standard size No. 50. One is placed at each end of the hopper well. The normal working radius of each crane is 28-ft. and each is fitted with a grab bucket of 62/50 cu. ft. capacity. The cranes are capable of performing 80 operations each hour. The maximum working load is 5½ tons and the power for the dredging gear is provided by Dorman 6 cylinder 97 h.p. diesel engines transmitting power through fluid couplings. A Priestman "Under water Eye" is also fitted to each crane. The deck outfit includes a windlass and mooring winch, both electrically operated and supplied by Messrs. Thomas Reid & Sons (Paisley), Ltd.

Accommodation for the Master and Chief Engineer is arranged in the deck house amidships upon which are superimposed the wheel house and navigating bridge. The after deck house accommodates the officers' mess room, the bathrooms, a galley, lamp room, drying room, etc. Accommodation is arranged below the main deck forward for 10 seamen with mess room and galley.

The propelling machinery constructed by Messrs. Ruston and Hornsby, Ltd., Lincoln, and installed aft, consists of a Ruston diesel engine developing 605 s.h.b. at 500 r.p.m.

Portable Industrial Vacuum Cleaner

Maintenance engineers in particular, and all concerned with cleaning problems in general, will be interested in the new Filtavac Model RM22 portable industrial vacuum cleaner.

Ladder work is eliminated in wall and overhead beam cleaning, for this machine will clean up to 25-ft. in height without any auxiliary equipment and, by means of a special cleaning head all dirt and debris can be removed from the tops of beams while operating from ground level.

Aerodynamically designed impellers — a new principle in vacuum cleaner manufacture, give greater suction per rated horsepower than any other machine, resulting in more economic operational costs.

Another saving is effected by a coupling system, whereby two machines may be coupled in a matter of seconds, resulting in doubled suction power and capacity to deal with the more obstinate cleaning problems.

Other features are a specially designed undercarriage giving easy manoeuvrability, and a fitted multi-plug enabling the machine to be used on any type of power socket without changing plugs. By coupling to exhaust outlet, a powerful blast of air can be used for blowing out otherwise inaccessible parts of machinery, etc.

The makers are Filtavac, Ltd., of London.

Push Button Shunting

A revolutionary automatic system of handling trains of wagons in marshalling yards by push-button control has been developed in this country. The first installation was recently set up at the British Electricity Authority's Power Station at Leicester by Mitchell Engineering, Ltd., of Peterborough and London, its designers and manufacturers. A similar installation has been laid out at the National Coal Board's central coal preparation plant at Dalkeith.

It is claimed that the outstanding advantages of the new system are that it can cut by half the site area required, thus halving the first cost of the site, the cost of the sidings and their maintenance. It also reduces the length of track normally required, and practically eliminates the use of locomotives.

Under the new method, incoming wagons are taken from their

Manufacturers' Announcements—continued

sidings by special mechanical handling plant, loaded or unloaded, weighed and returned to the same sidings or to others without the use of locomotives or capstans. The whole operation is performed by electrical control supervised by operators in control cabins on the site. The only non-automatic function is the coupling and uncoupling of wagons in sidings, and the system is capable of handling coal at the rate of 1,000 tons or more an hour.

There is no limit to the size or capacity of this system which can be designed for factories, steel works, mines, power stations and dockyards, or anywhere where there are marshalling yards or incoming trainloads of wagons.

Tug for South Africa

Messrs. Wm. Simons & Company, Limited, Shipbuilders of Renfrew, recently launched the Twin Screw Tug, "R. B. Waterston," which they have constructed to the order of the South African Railway and Harbours Administration.

The dimensions of the vessel are:—

Length overall	155-ft. 0-in.
Breadth, moulded	34-ft. 0-in.
Depth, moulded	17-ft. 6-in.

The hull, partly riveted and partly welded, and the machinery were constructed under Lloyd's Special Survey. The vessel is propelled by two sets of independent triple expansion surface condensing engines, each fitted with steam reversing gear and of an indicated horse power sufficient to propel the vessel at about 13 knots.

Steam is provided to the propelling engines and auxiliary machinery from four cylindrical multitubular boilers, constructed for a working pressure of 200 lb. per sq. in. All operations are controlled from an operating bridge from which communication with the propelling engine room is provided, together with all the controls necessary for manipulating the vessel.

Accommodation for the Captain, Mate and Wireless Operator is on the lower bridge deck, and for the Engineer Officers and Petty Officers on the main deck. The accommodation for the crew of 20 men is arranged below the main deck.

The vessel is fitted with a large towing winch, and two towing hooks, a steam windlass and a steam winch. Radar, wireless, echo sounding equipment and direction-finding gear are also supplied.

SITUATIONS VACANT

TEES CONSERVANCY COMMISSIONERS
Chief Engineer's Department
Civil Engineers

The Tees Conservancy Commissioners invite applications for the appointment to their engineering staff of three civil engineers as assistants for work in connection with new dock development and general maintenance on the River Tees.

The appointments will be permanent, subject to a satisfactory probationary period being served.

Candidates for these posts should preferably have a university degree or be associate members of their appropriate professional institution and have extensive technical and practical experience in the design, construction and maintenance of engineering structures connected with dock, railway, road and building structures. They should have good experience in design, detailing, preparation of plans and quantities, estimating, specifications, contract documents and site organisation, including surveying, levelling setting out and control of works and measurement for monthly certificates.

In addition they would be required to have some specialised knowledge of one of the following:—

(a) Design and architectural treatment of various types of buildings, sewage disposal, drainage and water supply.
(b) Design and lay-out of dock railways and sidings.
(c) Structural steelwork in connection with transit sheds, warehouses and similar works.

Applications should give full particulars of age, education, qualifications, experience and names of referees under whom the applicant has served.

Salaries will be dependent upon satisfactory fulfilment of the above conditions.

Successful applicants will be required to pass a medical examination and become members of the Tees Conservancy Superannuation Fund and will be required to reside in the area. Transfer arrangements from existing Superannuation Schemes are available.

Applications should be addressed not later than 31st October, 1954, to:—
General Manager, Tees Conservancy Commissioners,
Queen's Terrace, Middlesbrough.

SITUATIONS VACANT (Continued)

HEAD, WRIGHTSON & CO., LTD., have the following vacancies in their McKee Iron & Steel Division:—

(a) Civil Engineer to take charge of layout and design of foundations and ancillary work for heavy industrial plant. Must have general design and site experience. A.M.I.C.E. preferred.
(b) Civil Engineering Assistants for design section. Some opportunities exist to gain site experience. Preference given to candidates who have passed Final Part I and II of the A.M.I.C.E. examination or hold exempting qualifications.

Excellent working conditions; 5-day week; pension scheme. Applications stating age, qualifications and salary required to Personnel Manager, Ref. MK/4, Teesdale Iron Works, Thornaby-on-Tees.

ASSISTANT ENGINEER wanted for Consulting Engineers' Office in London. Applicants should be chartered Civil or Mechanical Engineers with experience in the design and construction of dock and harbour mechanical plant and with specialist experience in Cranes. Apply by letter with full particulars of age, qualifications and experience to Rendel, Palmer & Tritton, 125, Victoria Street, London, S.W.1.

SITUATION WANTED

SENIOR CIVIL ENGINEER, also A.M.I.Mech.E., 35, desires position as Chief Engineer, or Deputy, to Port Authority, preferably overseas. Previous experience in same capacity. Would consider any type of maritime works appointment. Please write Empire Airmail, via Box 164.

TENDERS

THE ASSOCIATED ETHYL COMPANY LIMITED.
SEA WATER PUMP AND SLUICE VALVE.

33"/36" DRYSDALE HORIZONTAL PUMP with C.I. divided casing, used for pumping sea water. Phosphor bronze impeller, M.S. spindle and bronze sleeves, Bedplate for motor. Motor required but not available for sale: 590 B.H.P. (400 volts, 3 phase, 50 cycles).

	Delivery:		
Total head from all causes, in feet ...	50	45	40
Gallons per minute	30,000	23,000	15,000

36" ALLEY & McLELLAN No. 270 C.I. "SENTINEL" SLUICE VALVE, hand or electrically (5 h.p.) operated, and used for control of flow of sea water.

The Sluice Valve is available for inspection at The Associated Ethyl Company Limited, Hayle, Cornwall. Telephone number: Hayle 2351.

The pump casing can be inspected at the same address, and the impeller unit may be seen at The British Hydromechanics Research Association, Eastern Industrial Estate, Harlow, Essex, after first making an appointment through us at Northwich (Tel. number: Northwich 3241, Ext. 129).

THE COMMISSIONERS FOR THE PORT OF CALCUTTA.
NEW SAND SUCTION HOPPER DREDGER.

Tenders are invited from experienced Suction Dredger Builders for the construction and delivery in Calcutta of a:

TWIN SCREW SAND SUCTION BOW WELL HOPPER DREDGER of the following dimensions:

Length B.P. not exceeding	350-ft. 0-ins.
Breadth moulded, approximately ...	62-ft. 0-ins.
Draught loaded, not exceeding ...	16-ft. 9-ins.
Hopper capacity	60,000 cu. ft.
Pump capacity in solids per hour ...	5,000 tons.
Speed at maximum loaded draught ...	12 knots.

Drawings, Specifications and Conditions of Contract may be obtained by Shipbuilders from the Commissioners' Consulting Engineers, Messrs. Rendel, Palmer & Tritton, 125, Victoria Street, Westminster, London, S.W.1, on payment of a deposit of Rs. 20,000 or £1,500 Sterling, returnable on adjudication. Applications from Agents or other intermediaries will not be considered.

Tenderers are required, on submitting their tenders, to enclose with their Specifications and Drawings, proof of their recent experience in building dredgers of this particular type.

Tenders, in sealed envelopes, endorsed on the outside "TENDER FOR NEW SUCTION DREDGER" are to be submitted, in triplicate, of which one copy is to be addressed to:—
The Deputy Conservator,
The Commissioners for the Port of Calcutta,
15, Strand Road, Calcutta, India.
and two copies addressed to:—
Messrs. Rendel, Palmer & Tritton, Consulting Engineers,
125, Victoria Street, London, S.W.1.

The tenders must reach The Deputy Conservator not later than 1700 hours I.S.T. on the 15th December, 1954, at Calcutta, and the Consulting Engineers not later than 1130 hours G.M.T. on the 15th December, 1954.

Quotations from the tenderers must be firm and remain open for a period of fourteen weeks from the closing date.

The Commissioners do not bind themselves to accept the lowest or any tender and reserve the right to reject a tender without assigning any reasons.

(Sgd.) Deputy Conservator,
CALCUTTA PORT COMMISSIONERS.